Rubin Observatory

Vera C. Rubin Observatory
Data Management

Data Management Detailed Product Tree

DMLT

DMTN-104

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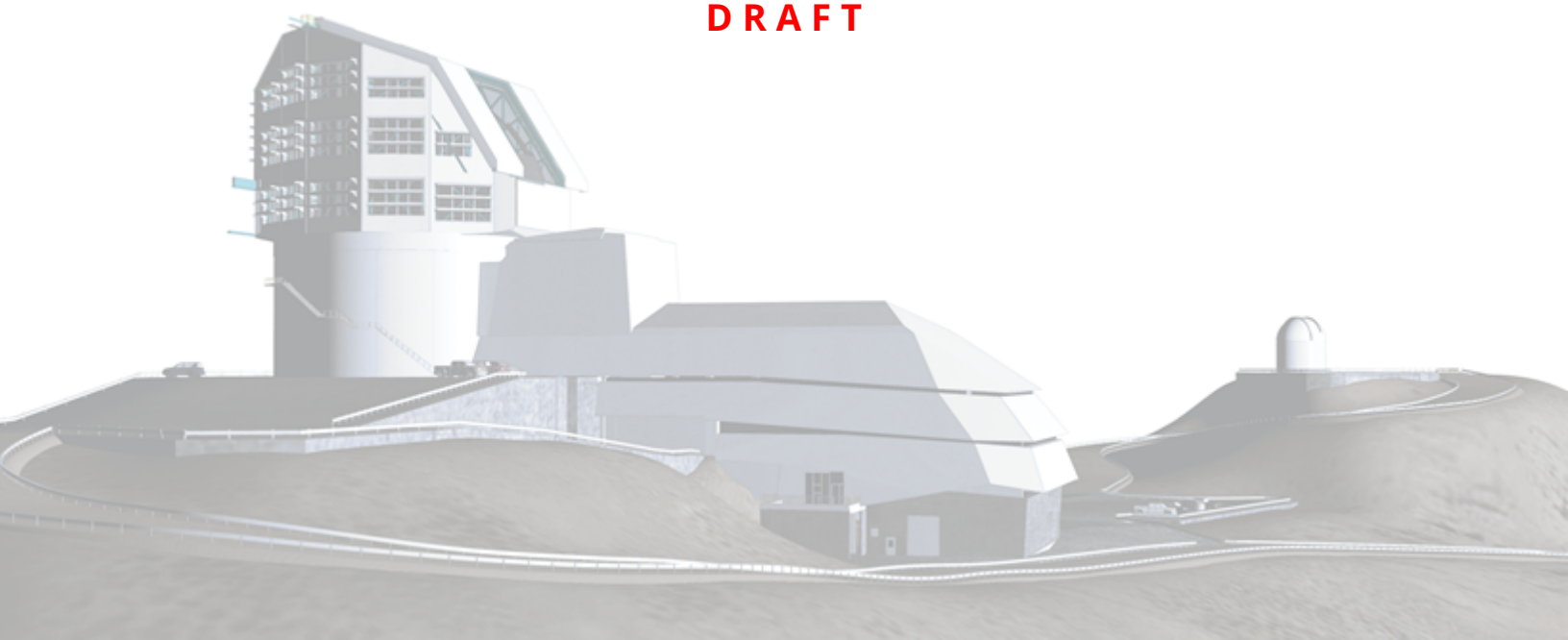
DRAFT



Abstract

This document collects in one place all DM products and their characterization.

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Change Record

Version	Date	Description	Owner name
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Document curator: G. Comoretto

Contents

Data Management Detailed Product Tree

1 Introduction

1.1 Obective

The objective is to provide a clear picture on the DM management products, including description, characterization and dependencies.

1.2 Definitions

Following definitions are relevant for this document.

1.2.1 Product

A product is a component of the DM product tree, that contribute to satisfy the DM requirements.

Each product is characterize by:

- **Name**: it is the main identification of the product. In some cases a *short name* can be provided for documentation purposes.
- **Unique Key**: it is a unique string mainly for programmatic usage. The product manager/owner can provide one, or it will be assigned by the Architecture team.
- **Owner**: who is responsible for the quality and acceptance of a particular product (LDM-294 §6.6).
- **Manager**: T/CAM who has managerial and financial responsibility for the engineering teams within DM (LDM-294 §6.14.1).
- **WBS**: the WBS identification.
- **Team**: the team in which the product is developed.

- **Description**: it provides a short overview of the product purpose.
- **Git Package**: the Git package that implementes the product.
  - **software products**: it shall be the top levelpackage as per DMTN-106 definition.
  - **services**: it should be the Git package where the Dockerfile defining the service is defined. The same repository could be used to keep under configuratino control other configuration files related to kubernettes definition (except secrets).
- **Dependencies**: the list of products required to implement this product.
- **Upstream Products**: the list is products that use this product.
- **Links**: internet links that provide inportant information in order to clearly define the product.
- **Documentation**: list of Rubin documents that characterize the product.
- **Requirements**: list of requirements that are related in the model to the product.

1.2.2 Software Product

Please refer to DMTN-106 section $2 for the Software Product definition.

1.2.3 Product Tree

The product tree is the graphical representation of the DM products.

1.2.4 Dependencies

The dependencies listed in this document are functional dependencies. The aim is to provide, for each product, the list of other products needed for its implementation or execution.

1.3 Applicable Documents

Following documents are applicable:

LDM-294 Data Management Organization and Management

1.4 Document Overview

Information in sections 2 and 3 is extracted from MagicDraw and provides:

- the DM top level product tree: it includes all products required to satisfy the DMS requirements (LSE-61).
- the DM support product tree: it includes all products required for construction and maintenance.

The information regarding the Git packages implementing the above products (in sections 2 and 3) is provided in section 4. This information is extracted from GitHub.

The section 5 lists all non DM products that are required in order to fulfill the DMS requirements. This information is extracted from MagicDraw. No GitHub package details are provided for these products.

The last section 7 will document all components in the DM Jira project.

1.5 Consistency and Completeness

The information collected in the product tree shall be consistent and complete.

In order to be consistent, following rules need to be fulfilled:

- Facilities: shall host Enclaves
- Enclaves: shall host services
- Services: shall be implemented using DM Software Products or COTS
- DM Software Products: shall have only one GitHub package

- Low level dependencies to be made explicit in section 4
- Dependencies to 3rd party libraries should (not yet, but will be) derived from GitHub
- COTS and 3rd party libraries: shall have a link to a documentation page available in the global internet

In order to be complete, following rules need to be fulfilled:

- All products shall have an owner
- All packages (subsection, paragraphs) shall have a manager In case of multiple managers in the underlying products, no manager is specified and Arch Team will review it.
- Each manager and each owner needs ensure that:
  - She/he is the right person of taking care of that package/product
  - The information provided for each package/product is sufficient to characterize it.
- Architecture Team shall ensure the consistency of the document following the rules listed above.

2 Top Level Product Tree

The products listed in this section are maintained in MagicDraw by the DM System Engineering group.

These products are meant to be operational, i.e. will process the survey source data and produce L1 or L2 data products, or will be distributed to permit the external collaborators and the science community to provide their contribution to the project.

2.1 Data Management Operational Products

Manager	Owner	WBS	Team
Wil O'Mullane	Leanne Guy	1.02C	
	Short name: **Data Management** - Product key: **DM**		
LSE-61	Data Management System (DMS) Requirements		
LDM-639	Rubin Observatory Data Management Acceptance Test Specification		
LDM-148	Data Management System Design		
LDM-692	DM Verification Control Document		

The products listed in the following subsections are DM provided products, required in order to satisfy the DM requirements at all levels (LSE-61, interfaces and low level flow down requirements).

These products are organized in the following groups:

- service products
- software products (developed by DM)
- infrastructure products (physical or logical)

The product tree graph for DM is available at this link .

2.2 Service Products

Manager	Owner	WBS	Team

Short name: **Services** - Product key: **DMSRV**

This product includes all services required for:

- data distribution (DBB)
- data processing (prompt and offline)
- data access (LSP)
- supporting activities (IT, monitoring, DBs, etc)

All services should be characterize by the implementing products and by a configuration file (docker or similar) maintained in GitHub repository.

The configuration file should follow the same development and releases processes defined for the DM software products.

All services shall also specify which software products, DM, third party or COTS, are implementing it. This information is shown in the **Product Dependencies** table, *Uses* column.

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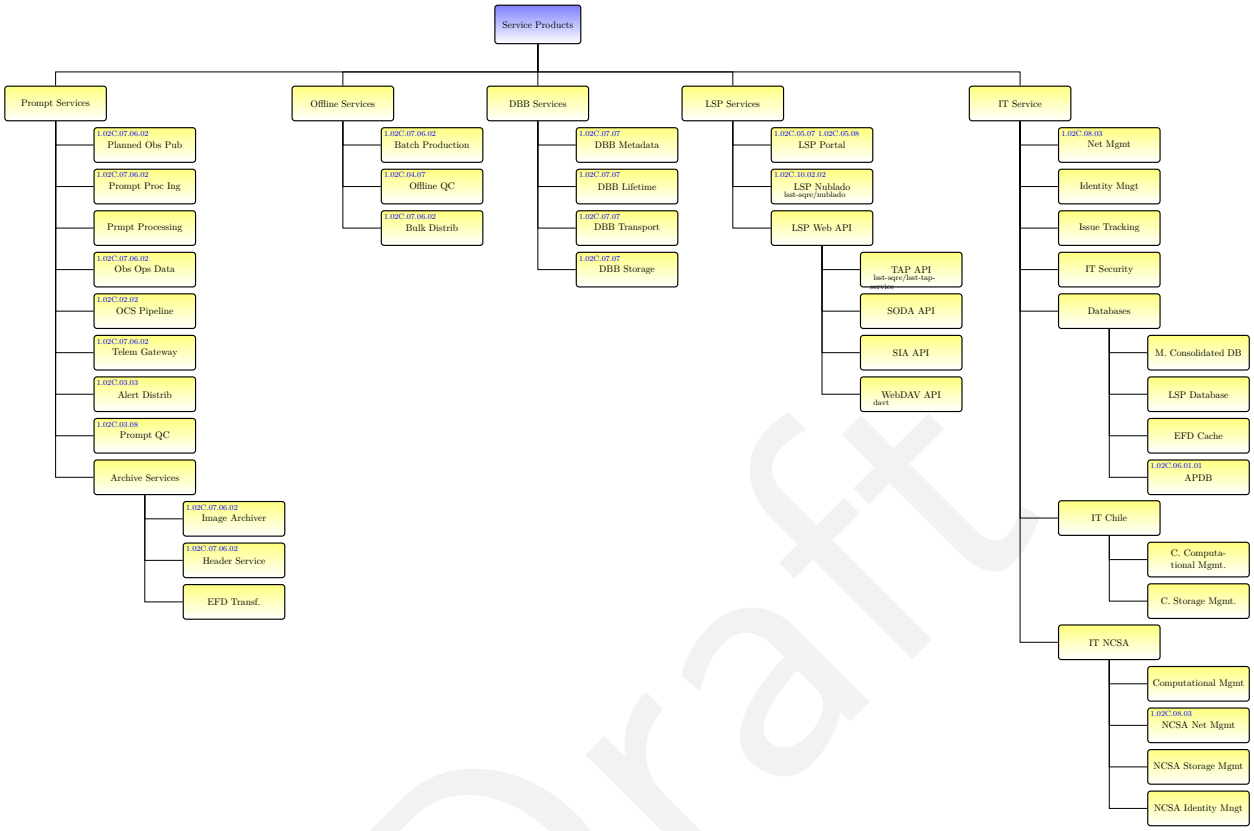

2.2.1 Prompt Services

Manager	Owner	WBS	Team

Short name: **Prompt Services** - Product key: **PRSRV**

DM Services that need to run in a prompt manner.

[last reviewed: K.T. Lim - Apr. 2020]

Products included in this section:

- Planned Observation Publication - POPSRV
- Prompt Processing Ingest - PRPINGSRV
- Prompt Processing - PRPRSRV
- Observatory Operations Data - OODSSRV
- OCS Controlled Pipeline Service - OCPSRV
- Telemetry Gateway - TMGSRV
- Alert Distribution - ALRTDSTSRV
- Prompt Quality Control - PRQCSRV

Planned Observation Publication		(product in: Prompt Services)	
Manager	**Owner**	**WBS**	**Team**
Michelle Butler	Tim Jenness Kian-Tat Lim	1.02C.07.06.02	LDF
Short name: **Planned Obs Pub** - Product key: **POPSRV**			

This service receives telemetry from the OCS describing the next visit location and the telescope scheduler's predictions of its future observations. It publishes these as an unauthenticated, globally-accessible web service comprising both a web page for human inspection and a web API for usage by automated tools.

[last reviewed: K.T. Lim - Apr. 2020]

Uses:	**Used in:**
Planned Observation Publication SW	Prompt Base Enclave

Related Requirements	
DMS-REQ-0353	Publishing predicted visit schedule

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Prompt Processing Ingest		(product in: Prompt Services)	
Manager	**Owner**	**WBS**	**Team**
Michelle Butler	Robert Gruendl	1.02C.07.06.02	LDF
Short name: **Prompt Proc Ing** - Product key: **PRPINGSRV**			

This service is implemented in two instances that capture crosstalk-corrected images from the LSSTCam and ComCam Camera Data Systems along with selected metadata from the OCS and/or EFD and transfer them to the Prompt Processing service in the Prompt NCSA Enclave. There is no Prompt Processing Ingest instance for the auxiliary telescope spectrograph.

Uses:	**Used in:**
Image Ingest and Processing	Prompt Base Enclave Prompt US Enclave

Related Requirements

CA-DM-CON-ICD-0007	Provide Data Management Conditions data
CA-DM-CON-ICD-0008	Data Management Conditions data latency
CA-DM-CON-ICD-0014	Provide science sensor data
CA-DM-CON-ICD-0015	Provide wavefront sensor data
CA-DM-CON-ICD-0016	Provide guide sensor data
CA-DM-CON-ICD-0017	Data Management load on image data interfaces
DM-TS-CON-ICD-0002	Timing
DM-TS-CON-ICD-0007	Timing
DMS-REQ-0004	Nightly Data Accessible Within Specified Time
DMS-REQ-0008	Pipeline Availability
DMS-REQ-0022	Crosstalk Corrected Science Image Data Acquisition
DMS-REQ-0099	Level 1 Performance Report Definition
DMS-REQ-0131	Calibration Images Available Within Specified Time
DMS-REQ-0162	Pipeline Throughput
DMS-REQ-0167	Incorporate Autonomics
DMS-REQ-0284	Level-1 Production Completeness
DMS-REQ-0294	Processing of Datasets
DMS-REQ-0301	Control of Level-1 Production
DMS-REQ-0314	Compute Platform Heterogeneity
DMS-REQ-0315	DMS Communication with OCS

DMS-REQ-0318	Data Management Unscheduled Downtime
OCS-DM-COM-ICD-0003	Data Management CSC Command Response Model
OCS-DM-COM-ICD-0004	Data Management Exposed CSCs
OCS-DM-COM-ICD-0007	Prompt Processing CSC
OCS-DM-COM-ICD-0009	Command Set Implementation by Data Management
OCS-DM-COM-ICD-0012	Start Command
OCS-DM-COM-ICD-0013	configure Successful Completion Response
OCS-DM-COM-ICD-0014	enable Command
OCS-DM-COM-ICD-0015	disable Command
OCS-DM-COM-ICD-0036	standby Command
OCS-DM-COM-ICD-0037	exit Command
OCS-DM-COM-ICD-0038	enterControl Command
OCS-DM-COM-ICD-0039	enterControl Successful Completion Response
OCS-DM-COM-ICD-0040	Command Completion Response
OCS-DM-COM-ICD-0046	Image Forwarded Event
OCS-DM-COM-ICD-0056	Prompt Processing Resource Availability

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Prompt Processing		(product in: Prompt Services)	
Manager	**Owner**	**WBS**	**Team**
Michelle Butler	Eric Bellm		
Short name: **Prmpt Processing** - Product key: **PRPRSRV**			

(from LDM-148)

This service receives images and metadata from the Prompt Processing Ingest service at the Base and executes the Alert Production science payload on them, generating “online” data products that are stored in the Data Backbone. The Alert Production payload then sends alerts to the Alert Distribution service.

The Prompt Processing service has calibration (including Collimated Beam Projector images), science, and deep drilling modes. In calibration mode, it executes a Raw Calibration Validation payload that provides rapid feedback of raw calibration image quality. In normal science mode, two consecutive exposures are grouped and processed as a single visit. Definitions of exposure groupings to be processed as visits in deep drilling and other modes are TBD. The service is required to deliver Alerts within 60 seconds of the final camera readout of a standard science visit with 98% availability.

There is no Prompt Processing service instance for the Auxiliary Telescope Spectrograph.

Uses:	**Used in:**
Alert Production	Prompt US Enclave
Calibration Software	
Solar System processing and Forced Photometry	
Image Ingest and Processing	

Related Requirements	
CA-DM-CON-ICD-0007	Provide Data Management Conditions data

CA-DM-CON-ICD-0008	Data Management Conditions data latency
DM-TS-CON-ICD-0002	Timing
DM-TS-CON-ICD-0006	Data
DM-TS-CON-ICD-0007	Timing
DM-TS-CON-ICD-0011	Data Format
DMS-REQ-0002	Transient Alert Distribution
DMS-REQ-0004	Nightly Data Accessible Within Specified Time
DMS-REQ-0008	Pipeline Availability
DMS-REQ-0099	Level 1 Performance Report Definition
DMS-REQ-0131	Calibration Images Available Within Specified Time
DMS-REQ-0162	Pipeline Throughput
DMS-REQ-0167	Incorporate Autonomics
DMS-REQ-0284	Level-1 Production Completeness
DMS-REQ-0294	Processing of Datasets
DMS-REQ-0301	Control of Level-1 Production
DMS-REQ-0312	Level 1 Data Product Access
DMS-REQ-0314	Compute Platform Heterogeneity
DMS-REQ-0318	Data Management Unscheduled Downtime
DMS-REQ-0321	Level 1 Processing of Special Programs Data
DMS-REQ-0344	Constraints on Level 1 Special Program Products Generation
DMS-REQ-0346	Data Availability
OCS-DM-COM-ICD-0007	Prompt Processing CSC
OCS-DM-COM-ICD-0048	Alert Production Complete Event
OCS-DM-COM-ICD-0049	WCS Information
OCS-DM-COM-ICD-0050	PSF Information
OCS-DM-COM-ICD-0051	Photometric Zeropoint Information
OCS-DM-COM-ICD-0052	Number of Alerts Information
OCS-DM-COM-ICD-0056	Prompt Processing Resource Availability

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Observatory Operations Data		(product in: Prompt Services)	
Manager	**Owner**	**WBS**	**Team**
Michelle Butler	Robert Gruendl	1.02C.07.06.02	LDF
Short name: **Obs Ops Data** - Product key: **OODSSRV**			

This service provides a cache of images, calibration data, and metadata to clients within Observatory Operations including Summit systems and the Commissioning Cluster. It provides a Data Butler interface to the data. It provides images with low latency and high reliability.

Uses:	**Used in:**
Observatory Operations Data Service SW	Prompt Base Enclave

Related Requirements

CA-DM-DAQ-ICD-0052	Correction constants for science sensors sourced by Data Management
DM-TS-CON-ICD-0003	Wavefront image archive access
DM-TS-CON-ICD-0009	Calibration Data Products
DMS-REQ-0167	Incorporate Autonomics
DMS-REQ-0314	Compute Platform Heterogeneity
DMS-REQ-0318	Data Management Unscheduled Downtime
DMS-REQ-0346	Data Availability

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OCS Controlled Pipeline Service		(product in: Prompt Services)	
Manager	**Owner**	**WBS**	**Team**
Kian-Tat Lim	Tim Jenness	1.02C.02.02	ARCH
	Short name: **OCS Pipeline** - Product key: **OCPSRV**		
DMTN-133	OCS driven data processing		

This service permits driving pipeline processing by data acquisition from the summit. The processing will be triggered using commands, which indicate the name of the pipelines to execute and the data to process.

Uses:	**Used in:**
OCPS SW	Prompt Base Enclave

Related Requirements

DMS-REQ-0008	Pipeline Availability
DMS-REQ-0101	Level 1 Calibration Report Definition
DMS-REQ-0131	Calibration Images Available Within Specified Time
DMS-REQ-0162	Pipeline Throughput
DMS-REQ-0265	Guider Calibration Data Acquisition
DMS-REQ-0289	Calibration Production Processing
DMS-REQ-0294	Processing of Datasets
DMS-REQ-0301	Control of Level-1 Production
DMS-REQ-0314	Compute Platform Heterogeneity
DMS-REQ-0315	DMS Communication with OCS
DMS-REQ-0318	Data Management Unscheduled Downtime
OCS-DM-COM-ICD-0003	Data Management CSC Command Response Model
OCS-DM-COM-ICD-0009	Command Set Implementation by Data Management
OCS-DM-COM-ICD-0012	Start Command
OCS-DM-COM-ICD-0013	configure Successful Completion Response
OCS-DM-COM-ICD-0014	enable Command
OCS-DM-COM-ICD-0015	disable Command
OCS-DM-COM-ICD-0035	OCS-Driven Batch CSC
OCS-DM-COM-ICD-0036	standby Command
OCS-DM-COM-ICD-0037	exit Command
OCS-DM-COM-ICD-0038	enterControl Command

OCS-DM-COM-ICD-0039	enterControl Successful Completion Response
OCS-DM-COM-ICD-0040	Command Completion Response

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Telemetry Gateway		(product in: Prompt Services)	
Manager	**Owner**	**WBS**	**Team**
Michelle Butler	Robert Gruendl	1.02C.07.06.02	LDF
Short name: **Telem Gateway** - Product key: **TMGSRV**			

This service is implemented by the DMCS, a more general system that manages communication from and to the Observatory. The DMCS is developed as part of the Image Ingest and Processing software product.

Uses:	**Used in:**
Image Ingest and Processing	Prompt Base Enclave

Related Requirements

CA-DM-CON-ICD-0007	Provide Data Management Conditions data
CA-DM-CON-ICD-0008	Data Management Conditions data latency
DM-TS-CON-ICD-0002	Timing
DM-TS-CON-ICD-0004	Use OCS for data transport
DM-TS-CON-ICD-0006	Data
DM-TS-CON-ICD-0007	Timing
DM-TS-CON-ICD-0011	Data Format
DMS-REQ-0008	Pipeline Availability
DMS-REQ-0314	Compute Platform Heterogeneity
DMS-REQ-0315	DMS Communication with OCS
DMS-REQ-0318	Data Management Unscheduled Downtime
OCS-DM-COM-ICD-0017	Data Management Telemetry Interface Model
OCS-DM-COM-ICD-0018	Data Management Telemetry Time Stamp
OCS-DM-COM-ICD-0019	Data Management Events and Telemetry Required by the OCS
OCS-DM-COM-ICD-0020	Image and Visit Processing and Archiving Status
OCS-DM-COM-ICD-0021	Data Quality Metrics
OCS-DM-COM-ICD-0022	System Health Metrics
OCS-DM-COM-ICD-0043	Image Retrieval for Archiving Event
OCS-DM-COM-ICD-0044	Image Retrieval For Processing Event
OCS-DM-COM-ICD-0045	Image in OODS Event
OCS-DM-COM-ICD-0046	Image Forwarded Event
OCS-DM-COM-ICD-0047	Image Archived Event
OCS-DM-COM-ICD-0048	Alert Production Complete Event

OCS-DM-COM-ICD-0049	WCS Information
OCS-DM-COM-ICD-0050	PSF Information
OCS-DM-COM-ICD-0051	Photometric Zeropoint Information
OCS-DM-COM-ICD-0052	Number of Alerts Information
OCS-DM-COM-ICD-0053	Summit-Base Network Utilization
OCS-DM-COM-ICD-0054	Base-Archive Network Utilization
OCS-DM-COM-ICD-0055	Archiver Resource Availability
OCS-DM-COM-ICD-0056	Prompt Processing Resource Availability

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Alert Distribution		(product in: Prompt Services)	
Manager	**Owner**	**WBS**	**Team**
Yusra AlSayyad	Eric Bellm	1.02C.03.03	AP
Short name: **Alert Distrib** - Product key: **ALRTDSTSRV**			

Alert Distribution and Filtering Service

Uses:	**Used in:**
Alert Distribution SW	Prompt US Enclave

Related Requirements

DMS-REQ-0002	Transient Alert Distribution
DMS-REQ-0004	Nightly Data Accessible Within Specified Time
DMS-REQ-0008	Pipeline Availability
DMS-REQ-0161	Optimization of Cost, Reliability and Availability in Order
DMS-REQ-0162	Pipeline Throughput
DMS-REQ-0167	Incorporate Autonomics
DMS-REQ-0314	Compute Platform Heterogeneity
DMS-REQ-0318	Data Management Unscheduled Downtime
DMS-REQ-0342	Alert Filtering Service
DMS-REQ-0343	Performance Requirements for LSST Alert Filtering Service
DMS-REQ-0348	Pre-defined alert filters

Prompt Quality Control		(product in: Prompt Services)	
Manager	**Owner**	**WBS**	**Team**
Yusra AlSayyad	Eric Bellm	1.02C.03.08	AP
	Short name: **Prompt QC** - Product key: **PRQCSRV**		

This service collects all KPI metrics calculated by the prompt processing service, aggregate the information and provides reports in order to ensure the monitoring of the quality of the processing and of the data collected by the survey.

Uses:	**Used in:**
Quality Control SW	Prompt US Enclave

Related Requirements

DMS-REQ-0096	Generate Data Quality Report Within Specified Time
DMS-REQ-0097	Level 1 Data Quality Report Definition
DMS-REQ-0098	Generate DMS Performance Report Within Specified Time
DMS-REQ-0099	Level 1 Performance Report Definition
DMS-REQ-0100	Generate Calibration Report Within Specified Time
DMS-REQ-0101	Level 1 Calibration Report Definition
DMS-REQ-0314	Compute Platform Heterogeneity
DMS-REQ-0318	Data Management Unscheduled Downtime

2.2.1.1 Archiving Services

Manager	Owner	WBS	Team
			LDF
Short name: **Archive Services** - Product key: **ARCSRVS**			

Services involved in the acquisition of the data.

[last reviewed: K.T. Lim - Apr. 2020]

Products included in this section:

- Image Archiver - IMAS
- Header Service - HEADS
- EFD Transformation - EFDTS

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Image Archiver		(product in: Archive Services)	
Manager	**Owner**	**WBS**	**Team**
Michelle Butler	Robert Gruendl	1.02C.07.06.02	LDF
	Short name: **Image Archiver** - Product key: **IMAS**		

This service capture raw images taken by a camera, retrieving them from the corresponding Camera Data System instance.

The image pixels and metadata are passed to the Observatory Operations Data Service (OODS), which serves as a buffer from which observing-critical data can be retrieved. They are also passed to a staging area for ingestion into the permanent archive in the Data Backbone.

Uses:	**Used in:**
Image Ingest and Processing	Prompt Base Enclave

Related Requirements

Header Service		(product in: Archive Services)	
Manager	**Owner**	**WBS**	**Team**
Michelle Butler	Robert Gruendl	1.02C.07.06.02	LDF
	Short name: **Header Service** - Product key: **HEADS**		

The Header Service, written by Data Management but operated by the Observatory, captures specific sets of metadata associated with the images, including telemetry values and event timings, from the OCS publish/subscribe middleware and/or from the EFD. It formats these into a metadata package that is recorded in the EFD Large File Annex. The Archiver and CatchUp Archiver instances retrieve this metadata package and attach it to the captured image pixels.

Uses:	**Used in:**
Header Service SW	Prompt Base Enclave

Related Requirements

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EFD Transformation		(product in: Archive Services)	
Manager	**Owner**	**WBS**	**Team**
Frossie Economou	Simon Krughoff		SQuaRE
Short name: **EFD Transf.** - Product key: **EFDTS**			

The EFD Transformation service extracts all information (including telemetry, events, configurations, and commands) from the EFD and its large file annex, transforms it into a form more suitable for querying by image timestamp, and loads it into the permanently archived "Transformed EFD" database in the Data Backbone.

Uses:	**Used in:**
EFD Transformation SW	Prompt Base Enclave

Related Requirements

2.2.2 Offline Services

Manager	Owner	WBS	Team

Short name: **Offline Services** - Product key: **OFFLSRV**

DM services that do not need to run in a prompt manner.

[last reviewed: K.T. Lim - Apr. 2020]

Products included in this section:

- Batch Production - PRODSRV
- Offline Quality Control - OFFLQCSRV
- Bulk Distribution - BULKDSRV

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Batch Production		(product in: Offline Services)	
Manager	**Owner**	**WBS**	**Team**
Michelle Butler	Michelle Gower	1.02C.07.06.02	LDF
Short name: **Batch Production** - Product key: **PRODSRV**			
LDM-636	Batch Production Service Requirements		

Batch Production Service

Uses:	**Used in:**
Workload/ Workflow Management	Offline Production Enclave
HTCondor	
Calibration Software	
Data Release Production	
Solar System processing and Forced Photometry	
Special Programs Productions	

Related Requirements

DMS-REQ-0008	Pipeline Availability
DMS-REQ-0156	Provide Pipeline Execution Services
DMS-REQ-0163	Re-processing Capacity
DMS-REQ-0167	Incorporate Autonomics
DMS-REQ-0294	Processing of Datasets
DMS-REQ-0302	Production Orchestration
DMS-REQ-0303	Production Monitoring
DMS-REQ-0304	Production Fault Tolerance
DMS-REQ-0307	Unique Processing Coverage
DMS-REQ-0308	Software Architecture to Enable Community Re-Use
DMS-REQ-0314	Compute Platform Heterogeneity
DMS-REQ-0318	Data Management Unscheduled Downtime
DMS-REQ-0388	Provide Re-Run Tools
DMS-REQ-0389	Re-Runs on Similar Systems
DMS-REQ-0390	Re-Runs on Other Systems

Offline Quality Control		(product in: Offline Services)	
Manager	**Owner**	**WBS**	**Team**
Yusra AlSayyad	Jim Bosch	1.02C.04.07	DRP
	Short name: **Offline QC** - Product key: **OFFLQCSRV**		

This service collects all KPI metrics calculated by the offline processing activities, aggregate the information and provides reports in order to ensure the monitoring of the quality of the processing and of the data collected by the survey.

Uses:	**Used in:**
Quality Control SW	Prompt US Enclave Offline Production Enclave

Related Requirements

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Bulk Distribution		(product in: Offline Services)	
Manager	**Owner**	**WBS**	**Team**
Michelle Butler	Robert Gruendl	1.02C.07.06.02	LDF
	Short name: **Bulk Distrib** - Product key: **BULKDSRV**		

Bulk Data Distribution Service

Uses:	**Used in:**
Rucio	Offline Production Enclave

Related Requirements

DMS-REQ-0122	Access to catalogs for external Level 3 processing
DMS-REQ-0123	Access to input catalogs for DAC-based Level 3 processing
DMS-REQ-0126	Access to images for external Level 3 processing
DMS-REQ-0127	Access to input images for DAC-based Level 3 processing
DMS-REQ-0185	Archive Center
DMS-REQ-0186	Archive Center Disaster Recovery
DMS-REQ-0193	Data Access Centers
DMS-REQ-0300	Bulk Download Service
DMS-REQ-0314	Compute Platform Heterogeneity
DMS-REQ-0318	Data Management Unscheduled Downtime
DMS-REQ-0346	Data Availability
EP-DM-CON-ICD-0001	US DAC Provides EPO Interface
EP-DM-CON-ICD-0004	DM Transfer of Catalog Data to EPO
EP-DM-CON-ICD-0009	Catalog Format
EP-DM-CON-ICD-0014	Color Co-Add Image Format
EP-DM-CON-ICD-0019	DM to EPO Data Transfer Cadence
EP-DM-CON-ICD-0021	DM Generation of a Color Hierarchical Progressive Survey for EPO
EP-DM-CON-ICD-0022	Annual DM Transfer of UGRIZY+Panchromatic Co-Add Images to EPO
EP-DM-CON-ICD-0023	Nightly DM Transfer of Processed Visit Images (PVI)-Based Images to EPO

2.2.3 Backbone Services

Manager	Owner	WBS	Team
Michelle Butler			
	Short name: **DBB Services** - Product key: **DBBSRV**		
LDM-230	Concept of Operations for the LSST Data Facility Services		

The Backbone services supply data to other services.
They are implemented in the Archive enclaves.

Detailed concepts of operations for each service can be found in LDM-230

Products included in this section:

- DBB Ingest/ Metadata Management - DBBMDSRV
- DBB Lifetime Management - DBBLIFESRV
- DBB Transport/ Replication/ Backup - DBBTRSRV
- DBB Storage - DBBSTRSRV

DBB Ingest/ Metadata Management		(product in: DBB Services)	
Manager	**Owner**	**WBS**	**Team**
	Michelle Gower	1.02C.07.07	LDF
Short name: **DBB Metadata** - Product key: **DBBMDSRV**			

This service within the Data Backbone is responsible for maintaining and providing access to the metadata describing the location, characteristics, and provenance of the data products it manages. Part of this service involves creating the appropriate metadata during ingest when data from external sources is incorporated into the DBB. The Batch Production services will generally create the necessary DBB metadata as part of their operation, so only a minimal ingest process is needed for internally-generated data products. Metadata is kept in a database that is a superset of the registry required by the Data Butler, allowing the Butler to directly access data within the DBB.

Uses:	**Used in:**
DBB Ingest/ Metadata Management SW	Archive Base Enclave Archive US Enclave

Related Requirements

DMS-REQ-0008	Pipeline Availability
DMS-REQ-0068	Raw Science Image Metadata
DMS-REQ-0074	Difference Exposure Attributes
DMS-REQ-0077	Maintain Archive Publicly Accessible
DMS-REQ-0089	Solar System Objects Available Within Specified Time
DMS-REQ-0094	Keep Historical Alert Archive
DMS-REQ-0102	Provide Engineering & Facility Database Archive
DMS-REQ-0120	Level 3 Data Product Self Consistency
DMS-REQ-0122	Access to catalogs for external Level 3 processing
DMS-REQ-0123	Access to input catalogs for DAC-based Level 3 processing
DMS-REQ-0126	Access to images for external Level 3 processing
DMS-REQ-0127	Access to input images for DAC-based Level 3 processing
DMS-REQ-0130	Calibration Data Products
DMS-REQ-0131	Calibration Images Available Within Specified Time
DMS-REQ-0132	Calibration Image Provenance
DMS-REQ-0161	Optimization of Cost, Reliability and Availability in Order
DMS-REQ-0162	Pipeline Throughput

DMS-REQ-0163	Re-processing Capacity
DMS-REQ-0164	Temporary Storage for Communications Links
DMS-REQ-0165	Infrastructure Sizing for ”catching up”
DMS-REQ-0166	Incorporate Fault-Tolerance
DMS-REQ-0167	Incorporate Autonomics
DMS-REQ-0176	Base Facility Infrastructure
DMS-REQ-0185	Archive Center
DMS-REQ-0186	Archive Center Disaster Recovery
DMS-REQ-0197	No Limit on Data Access Centers
DMS-REQ-0266	Exposure Catalog
DMS-REQ-0269	DIASource Catalog
DMS-REQ-0271	DIAObject Catalog
DMS-REQ-0273	SSObject Catalog
DMS-REQ-0287	DIASource Precovery
DMS-REQ-0291	Query Repeatability
DMS-REQ-0292	Uniqueness of IDs Across Data Releases
DMS-REQ-0293	Selection of Datasets
DMS-REQ-0299	Data Product Ingest
DMS-REQ-0309	Raw Data Archiving Reliability
DMS-REQ-0310	Un-Archived Data Product Cache
DMS-REQ-0313	Level 1 & 2 Catalog Access
DMS-REQ-0314	Compute Platform Heterogeneity
DMS-REQ-0317	DIAForcedSource Catalog
DMS-REQ-0318	Data Management Unscheduled Downtime
DMS-REQ-0322	Special Programs Database
DMS-REQ-0334	Persisting Data Products
DMS-REQ-0338	Targeted Coadds
DMS-REQ-0339	Tracking Characterization Changes Between Data Releases
DMS-REQ-0346	Data Availability
DMS-REQ-0363	Access to Previous Data Releases
DMS-REQ-0364	Data Access Services
DMS-REQ-0365	Operations Subsets
DMS-REQ-0366	Subsets Support
DMS-REQ-0369	Evolution
DMS-REQ-0370	Older Release Behavior

DMS-REQ-0372	a Archiving Camera Test Data
DMS-REQ-0386	a Archive Processing Provenance
DMS-REQ-0387	b Serve Archived Provenance
DMS-REQ-0388	Provide Re-Run Tools
OCS-DM-COM-ICD-0047	Image Archived Event

DBB Lifetime Management		(product in: DBB Services)	
Manager	**Owner**	**WBS**	**Team**
	Michelle Gower	1.02C.07.07	LDF
Short name: **DBB Lifetime** - Product key: **DBBLIFESRV**			

This service is responsible for managing the lifetimes of data products within the DBB based on a set of policies. Data products may move from high-speed storage to near-line or offline storage or may be deleted completely. Some products are kept permanently. Some are kept for defined time periods as specified in requirements. Intermediate data products may be kept until all downstream products have been generated.

Uses:	**Used in:**
DBB Lifetime Management SW	Archive Base Enclave
	Archive US Enclave

Related Requirements

DMS-REQ-0310	Un-Archived Data Product Cache
DMS-REQ-0334	Persisting Data Products
DMS-REQ-0338	Targeted Coadds
DMS-REQ-0339	Tracking Characterization Changes Between Data Releases
DMS-REQ-0346	Data Availability

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DBB Transport/ Replication/ Backup	(product in: DBB Services)		
Manager	**Owner**	**WBS**	**Team**
	Michelle Gower	1.02C.07.07	LDF
Short name: **DBB Transport** - Product key: **DBBTRSRV**			

This service is responsible for moving data products from one Facility to another and to backup and disaster recovery storage. It handles recovery if a data product is found to be missing or corrupt.

Uses:	**Used in:**
DBB Transport/ Replication/ Backup SW	Archive Base Enclave
	Archive US Enclave

Related Requirements

DMS-REQ-0008	Pipeline Availability
DMS-REQ-0089	Solar System Objects Available Within Specified Time
DMS-REQ-0102	Provide Engineering & Facility Database Archive
DMS-REQ-0122	Access to catalogs for external Level 3 processing
DMS-REQ-0123	Access to input catalogs for DAC-based Level 3 processing
DMS-REQ-0126	Access to images for external Level 3 processing
DMS-REQ-0127	Access to input images for DAC-based Level 3 processing
DMS-REQ-0131	Calibration Images Available Within Specified Time
DMS-REQ-0161	Optimization of Cost, Reliability and Availability in Order
DMS-REQ-0162	Pipeline Throughput
DMS-REQ-0163	Re-processing Capacity
DMS-REQ-0164	Temporary Storage for Communications Links
DMS-REQ-0165	Infrastructure Sizing for ”catching up”
DMS-REQ-0166	Incorporate Fault-Tolerance
DMS-REQ-0167	Incorporate Autonomics
DMS-REQ-0185	Archive Center
DMS-REQ-0186	Archive Center Disaster Recovery
DMS-REQ-0197	No Limit on Data Access Centers
DMS-REQ-0287	DIASource Precovery
DMS-REQ-0309	Raw Data Archiving Reliability
DMS-REQ-0313	Level 1 & 2 Catalog Access
DMS-REQ-0314	Compute Platform Heterogeneity

DMS-REQ-0318	Data Management Unscheduled Downtime
DMS-REQ-0344	Constraints on Level 1 Special Program Products Generation
DMS-REQ-0366	Subsets Support
DMS-REQ-0370	Older Release Behavior

DBB Storage		(product in: DBB Services)	
Manager	**Owner**	**WBS**	**Team**
	Michelle Gower	1.02C.07.07	LDF
Short name: **DBB Storage** - Product key: **DBBSTRSRV**			

This service is responsible for storage of data products in the DBB. The storage service provides an interface usable by the Data Butler as a datastore.

Uses:	**Used in:**
DBB Transport/ Replication/ Backup SW	Archive Base Enclave
	Archive US Enclave

Related Requirements

DMS-REQ-0008	Pipeline Availability
DMS-REQ-0077	Maintain Archive Publicly Accessible
DMS-REQ-0089	Solar System Objects Available Within Specified Time
DMS-REQ-0094	Keep Historical Alert Archive
DMS-REQ-0102	Provide Engineering & Facility Database Archive
DMS-REQ-0122	Access to catalogs for external Level 3 processing
DMS-REQ-0123	Access to input catalogs for DAC-based Level 3 processing
DMS-REQ-0126	Access to images for external Level 3 processing
DMS-REQ-0127	Access to input images for DAC-based Level 3 processing
DMS-REQ-0130	Calibration Data Products
DMS-REQ-0131	Calibration Images Available Within Specified Time
DMS-REQ-0161	Optimization of Cost, Reliability and Availability in Order
DMS-REQ-0162	Pipeline Throughput
DMS-REQ-0163	Re-processing Capacity
DMS-REQ-0164	Temporary Storage for Communications Links
DMS-REQ-0165	Infrastructure Sizing for ”catching up”
DMS-REQ-0166	Incorporate Fault-Tolerance
DMS-REQ-0167	Incorporate Autonomics
DMS-REQ-0185	Archive Center
DMS-REQ-0186	Archive Center Disaster Recovery
DMS-REQ-0197	No Limit on Data Access Centers
DMS-REQ-0287	DIASource Precovery
DMS-REQ-0309	Raw Data Archiving Reliability

DMS-REQ-0310	Un-Archived Data Product Cache
DMS-REQ-0313	Level 1 & 2 Catalog Access
DMS-REQ-0314	Compute Platform Heterogeneity
DMS-REQ-0318	Data Management Unscheduled Downtime
DMS-REQ-0334	Persisting Data Products
DMS-REQ-0338	Targeted Coadds
DMS-REQ-0344	Constraints on Level 1 Special Program Products Generation
DMS-REQ-0346	Data Availability
DMS-REQ-0363	Access to Previous Data Releases
DMS-REQ-0364	Data Access Services
DMS-REQ-0365	Operations Subsets
DMS-REQ-0366	Subsets Support
DMS-REQ-0367	Access Services Performance
DMS-REQ-0368	Implementation Provisions
DMS-REQ-0370	Older Release Behavior
DMS-REQ-0372	a Archiving Camera Test Data
DMS-REQ-0386	a Archive Processing Provenance
DMS-REQ-0387	b Serve Archived Provenance

2.2.4 LSP Services

Manager	Owner	WBS	Team
Frossie Economou	Gregory Dubois-Felsmann		
	Short name: **LSP Services** - Product key: **LSPSRV**		
LSE-319	LSST Science Platform Vision Document		
LDM-540	LSST Science Platform Test Specification		
LDM-542	Science Platform Design		
DMTN-103	LSST Science Platform Deployments		
LDM-554	Data Management LSST Science Platform Requirements		

The Science Platform services provide an exploratory analysis environment for the end user. Related subsets of the services are designated as “Aspects” of the Science Platform, as follows:

- LSP Portal Aspect
- LSP Notebook Aspect (Nublado)
- LSP Web APIs Aspect (TAP, SODA, SIA and WebDAV)

These services permit external users access to project resources, such as data and processing SW. Templates for deployment on different platforms are provided in lsp-deploy Git repository.

[last reviewed: G. Dubois-Felsmann - Feb 2020]

Products included in this section:

- LSP Portal - PRTLSRV
- LSP Nublado - NBLSRV

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LSP Portal		(product in: LSP Services)	
Manager	**Owner**	**WBS**	**Team**
Gregory Dubois-Felsmann	Gregory Dubois-Felsmann	1.02C.05.07 1.02C.05.08	SUIT
Short name: **LSP Portal** - Product key: **PRTLSRV**			
DMTN-136	LSST Science Platform Portal Aspect Design and Maintenance Manual		

This service provides Web-based query and visualization tools for all the Rubin Observatory LSST data products.

The service is defined by the lsst/suit Github package (LSP Software Product), based on functionality from the third-party Firefly toolkit (partially supported by LSST DM), with releases delivered as Docker images.

[last reviewed: G. Dubois-Felsmann - Feb 2020]

Uses:	**Used in:**
LSP Portal Software	DAC US Enclave
LSP Portal Online Help	DAC Chile Enclave
	Commissioning Cluster Enclave

Related Requirements

DMS-REQ-0119	Level 3 Resource Allocation Mechanism
DMS-REQ-0123	Access to input catalogs for DAC-based Level 3 processing
DMS-REQ-0124	Federation with external catalogs
DMS-REQ-0127	Access to input images for DAC-based Level 3 processing
DMS-REQ-0160	Provide User Interface Services
DMS-REQ-0161	Optimization of Cost, Reliability and Availability in Order
DMS-REQ-0193	Data Access Centers
DMS-REQ-0194	Data Access Center Simultaneous Connections
DMS-REQ-0197	No Limit on Data Access Centers
DMS-REQ-0314	Compute Platform Heterogeneity
DMS-REQ-0318	Data Management Unscheduled Downtime
DMS-REQ-0341	Providing a Precovery Service

DMS-REQ-0363	Access to Previous Data Releases
DMS-REQ-0364	Data Access Services
DMS-REQ-0365	Operations Subsets
DMS-REQ-0366	Subsets Support
DMS-REQ-0367	Access Services Performance
DMS-REQ-0368	Implementation Provisions
DMS-REQ-0369	Evolution
DMS-REQ-0370	Older Release Behavior
DMS-REQ-0371	Query Availability
DMS-REQ-0382	HiPS Visualization
DMS-REQ-0385	MOC Visualization

LSP Nublado		(product in: LSP Services)	
Manager	**Owner**	**WBS**	**Team**
Frossie Economou	Simon Krughoff	1.02C.10.02.02	SQuaRE
	Short name: **LSP Nublado** - Product key: **NBLSRV**		

This service provides access to a Python-oriented computational environment, hosted at the LSST Data Access Centers. Through a Web-based notebook interface, users are able to run Python code in close proximity to the LSST data archive, accessing and analyzing the data and generating derived data products.

GitHub Packages:	lsst-sqre/nublado	4.1

Uses:	**Used in:**
LSP Notebook Software	DAC US Enclave
Science Pipelines Distribution	DAC Chile Enclave
	Commissioning Cluster Enclave

Related Requirements

DMS-REQ-0119	Level 3 Resource Allocation Mechanism
DMS-REQ-0123	Access to input catalogs for DAC-based Level 3 processing
DMS-REQ-0124	Federation with external catalogs
DMS-REQ-0127	Access to input images for DAC-based Level 3 processing
DMS-REQ-0161	Optimization of Cost, Reliability and Availability in Order
DMS-REQ-0193	Data Access Centers
DMS-REQ-0194	Data Access Center Simultaneous Connections
DMS-REQ-0197	No Limit on Data Access Centers
DMS-REQ-0314	Compute Platform Heterogeneity
DMS-REQ-0318	Data Management Unscheduled Downtime

2.2.4.1 LSP Web API

Manager	Owner	WBS	Team
Frossie Economou	Simon Krughoff		
	Short name: **LSP Web API** - Product key: **LSPWAPI**		

The API Aspect services provide remote access to the LSST data, user data, and user computing resources, through a set of Web APIs (many based on VO standards). The Web APIs will deliver data in community-standard formats, including, e.g., VOTable, CSV, and FITS. The same Web APIs are used internally in the Portal Aspect, and are also available in the Notebook Aspect.

Products included in this section:

- TAP API - TAPSRV
- SODA API - SODASRV
- SIA API - SIASRV
- WebDAV API - WDAVSRV

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TAP API		(product in: LSP Web API)	
Manager	**Owner**	**WBS**	**Team**
Frossie Economou	Simon Krughoff		
	Short name: **TAP API** - Product key: **TAPSRV**		

Provides query services for catalogs and image metadata, following the IVOA TAP standard.

See DMTN-090 for details (dmtn-090.lsst.io).

GitHub Packages:	lsst-sqre/lsst-tap-service	4.2

Uses:	**Used in:**
TAP Software	Commissioning Cluster Enclave
	DAC Chile Enclave
	DAC US Enclave

Related Requirements

SODA API		(product in: LSP Web API)	
Manager	**Owner**	**WBS**	**Team**
Frossie Economou	Simon Krughoff		
	Short name: **SODA API** - Product key: **SODASRV**		

Provides image cutout, transformation, and re-creation services, following the IVOA SODA standard.

See DMTN-090 for details (dmtn-090.lsst.io).

Uses:	**Used in:**
Image/ Cutout Server	Commissioning Cluster Enclave
	DAC Chile Enclave
	DAC US Enclave

Related Requirements

Rubin Observatory

SIA API		(product in: LSP Web API)	
Manager	**Owner**	**WBS**	**Team**
Frossie Economou	Simon Krughoff		
	Short name: **SIA API** - Product key: **SIASRV**		

Provides image metadata query services, following the IVOA SIA version 2 standard.

See DMTN-090 for details (dmtn-090.lsst.io).

Uses:	**Used in:**
	Commissioning Cluster Enclave
	DAC Chile Enclave
	DAC US Enclave

Related Requirements

Rubin Observatory

WebDAV API		(product in: LSP Web API)	
Manager	**Owner**	**WBS**	**Team**
Frossie Economou	Simon Krughoff		
	Short name: **WebDAV API** - Product key: **WDAVSRV**		

Provides remote access services to the User File Workspace, following the IETF WebDAV standard.

GitHub Packages:	davt	4.3

Uses:	**Used in:**
	Commissioning Cluster Enclave
	DAC Chile Enclave
	DAC US Enclave

Related Requirements

2.2.5 IT Services

Manager	Owner	WBS	Team

Short name: **IT Service** - Product key: **ITSRV**

The services grouped under this package are meant to be used to support operational activities.

Examples are:

- database instances available for operations
- operational resource (i.e. networks) management services

Products included in this section:

- Network Management - NETMGMT
- Identity Management - IDNMNG
- Issue Tracking - ITRCK
- IT Security - ITSEC

Network Management		(product in: IT Service)	
Manager	**Owner**	**WBS**	**Team**
Jeff Kantor	Wil O'Mullane	1.02C.08.03	Net/Base
	Short name: **Net Mgmt** - Product key: **NETMGMT**		

This service provides monitor capability on networks, including for example failover control, bandwidth allocation management.

Network engineering and implementation are also included in this product, but they are not services intended for the users.

This service covers the Summit and the Base facilities and the Long-Hault networks.

Other facilities, like for example NCSA will have their own network management service.

Uses:	**Used in:**

Related Requirements	
DMS-REQ-0008	Pipeline Availability
DMS-REQ-0166	Incorporate Fault-Tolerance
DMS-REQ-0167	Incorporate Autonomics
DMS-REQ-0175	Summit to Base Network Ownership and Operation

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Identity Management		(product in: IT Service)	
Manager	**Owner**	**WBS**	**Team**

Short name: **Identity Mngt** - Product key: **IDNMNG**

This service provides a single sign on facility to be used cross platform during all phases of the project. Each facility will have its own identity management service. There is no unified approach across the project.

Uses:	**Used in:**
CILogon	

Related Requirements

Rubin Observatory

Issue Tracking		(product in: IT Service)	
Manager	**Owner**	**WBS**	**Team**

Short name: **Issue Tracking** - Product key: **ITRCK**

Issue (ticket) tracking service.

Uses:	**Used in:**
JIRA	

Related Requirements

IT Security		(product in: IT Service)	
Manager	**Owner**	**WBS**	**Team**

Short name: **IT Security** - Product key: **ITSEC**

This service will implement login in for the DMS users, in order that access to portals can be secure and controlled.

Uses:	**Used in:**
IT Security SW	

Related Requirements

2.2.5.1 Databases

Manager	Owner	WBS	Team
Short name: **Databases** - Product key: **MNGDB**			

This section hosts database instances that are relevant for multiple products and services. All those databases that are embedded in a software product and do not have any interaction outside that, will not be included in the product tree.

Products included in this section:

- Managed Consolidated Database - MCDB
- LSP Database - LSPDB
- EFD Cache - EFDB
- APDB - APDB

Managed Consolidated Database	(product in: Databases)		
Manager	**Owner**	**WBS**	**Team**

Short name: **M. Consolidated DB** - Product key: **MCDB**

This service provides general-purpose relational database management that supports other services. It includes metadata and provenance, but it does not include the large catalog science data products that are generated as files and loaded into the Qserv parallel distributed database. For efficiency of resource usage and management, most databases are consolidated into a single RDBMS instance.

Uses:	**Used in:**

Related Requirements

LSP Database		(product in: Databases)	
Manager	**Owner**	**WBS**	**Team**

Short name: **LSP Database** - Product key: **LSPDB**

This service is a combination of database instances required by the LSP services. It will be instantiated in each DAC and used for:

- storing user data
- reading available catalogs.

Uses:	**Used in:**
Distributed Database	Commissioning Cluster Enclave
	DAC Chile Enclave
	DAC US Enclave

Related Requirements

Rubin Observatory

EFD Cache		(product in: Databases)	
Manager	**Owner**	**WBS**	**Team**
Frossie Economou	Simon Krughoff		

Short name: **EFD Cache** - Product key: **EFDB**

Uses:	**Used in:**
EFD Transformation SW	Prompt Base Enclave

Related Requirements

Rubin Observatory

APDB		(product in: Databases)	
Manager	**Owner**	**WBS**	**Team**
Fritz Mueller	Colin Slater	1.02C.06.01.01	DAX
	Short name: **APDB** - Product key: **APDB**		
DMTN-018	Re-visiting L1 Database Design		

Performance critical internal database used to support Alert Production; will not support end-user queries. Until October 2019 this product was known as L1 Database.

Implementation details still under evaluation.

[last reviewed: F.Mueller - Jan 2020]

Uses:	**Used in:**
	Prompt US Enclave

Related Requirements

2.2.5.2 IT Chile

Manager	Owner	WBS	Team
Short name: **IT Chile** - Product key: **ITCH**			

The services in this section are implemented in the Chilean facilities.

Products included in this section:

- Chilean Computational Nodes Management - CHCNM
- Chilean Storage Management - CHSTMNG

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Chilean Computational Nodes Management	(product in: IT Chile)		
Manager	**Owner**	**WBS**	**Team**
Cristian Silva	Wil O'Mullane		
	Short name: **C. Computational Mgmt.** - Product key: **CHCNM**		

This service provides the capability to instantiate computational nodes as required for data processing and other operational services in Chile facilities, La Serena and Base.

Uses:	**Used in:**

Related Requirements

Chilean Storage Management		(product in: IT Chile)	
Manager	**Owner**	**WBS**	**Team**
Cristian Silva	Wil O'Mullane		
	Short name: **C. Storage Mgmt.** - Product key: **CHSTMNG**		

This services provide filesystem and objects storage required for data processing and others operational services in Chile, Base and La Serena facilities.

Uses:	**Used in:**

Related Requirements

2.2.5.3 IT NCSA

Manager	Owner	WBS	Team
Michelle Butler			
Short name: **IT NCSA** - Product key: **ITNCSA**			

The services listed in this section are implemented at NCSA facility.

Products included in this section:

- NCSA Computational Nodes Management - NCSACNM
- NCSA Network Management - NCSANETMNG
- NCSA Storage Management - NCSASTMNG
- NCSA Identity Management - NCSAIDNMNG

NCSA Computational Nodes Management	(product in: IT NCSA)		
Manager	**Owner**	**WBS**	**Team**
	Wil O'Mullane		LDF
	Short name: **Computational Mgmt** - Product key: **NCSACNM**		

This service provides the capability to instantiate computational nodes as required for data processing and other operational services at NCSA.

Uses:	**Used in:**

Related Requirements

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NCSA Network Management		(product in: IT NCSA)	
Manager	**Owner**	**WBS**	**Team**
	Wil O'Mullane	1.02C.08.03	LDF
Short name: **NCSA Net Mgmt** - Product key: **NCSANETMNG**			

This service provides monitor capability on NCSA networks, including for example failover control, bandwidth allocation management.

Network engineering and implementation are also included in this product, but they are not services intended for the users.

Uses:	**Used in:**

Related Requirements

Rubin Observatory

NCSA Storage Management		(product in: IT NCSA)	
Manager	**Owner**	**WBS**	**Team**
	Wil O'Mullane		LDF
Short name: **NCSA Storage Mgmt** - Product key: **NCSASTMNG**			

This services provide filesystem and objects storage required for data processing and others operational services at NCSA.

Uses:	**Used in:**

Related Requirements

Rubin Observatory

NCSA Identity Management		(product in: IT NCSA)	
Manager	**Owner**	**WBS**	**Team**
			LDF
	Short name: **NCSA Identity Mngt** - Product key: **NCSAIDNMNG**		

This service provides sign on facility to NCSA services.

Uses:	**Used in:**
CILogon	

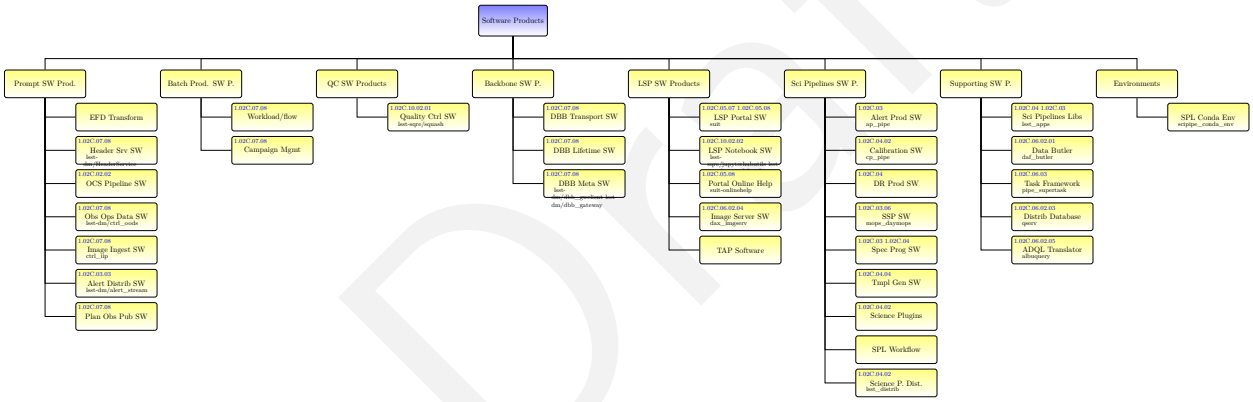
Related Requirements

2.3 Software Products

Manager	Owner	WBS	Team
Wil O'Mullane			
Short name: **Software Products** - Product key: **DMSW**			

DM operational SW products. This include all SW products implemented by the DM team in order to implement the operational services.

Dependencies should be derived from the corresponding Git packages definition.



2.3.1 Prompt Software Products

Manager	Owner	WBS	Team

Short name: **Prompt SW Prod.** - Product key: **PRSW**

DM software products required to implement the DM Prompt Services.

[last reviewed: K.T. Lim - Apr. 2020]

Products included in this section:

- Alert Distribution SW - ALRTDSTR
- EFD Transformation SW - EFDT
- Header Service SW - HEADER
- Image Ingest and Processing - IIP
- Planned Observation Publication SW - OBSPUB
- OCPS SW - OCPS
- Observatory Operations Data Service SW - OODS

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Alert Distribution SW		(product in: Prompt SW Prod.)	
Manager	**Owner**	**WBS**	**Team**
Yusra AlSayyad	Eric Bellm	1.02C.03.03	AP

Short name: **Alert Distrib SW** - Product key: **ALRTDSTR**

SW product for alert distribution and filtering.

GitHub Packages:	lsst-dm/alert_stream	4.7

Uses:	**Used in:**
	Alert Distribution

Related Requirements

DMS-REQ-0002	Transient Alert Distribution
DMS-REQ-0004	Nightly Data Accessible Within Specified Time
DMS-REQ-0008	Pipeline Availability
DMS-REQ-0161	Optimization of Cost, Reliability and Availability in Order
DMS-REQ-0162	Pipeline Throughput
DMS-REQ-0167	Incorporate Autonomics
DMS-REQ-0314	Compute Platform Heterogeneity
DMS-REQ-0318	Data Management Unscheduled Downtime
DMS-REQ-0342	Alert Filtering Service
DMS-REQ-0343	Performance Requirements for LSST Alert Filtering Service
DMS-REQ-0348	Pre-defined alert filters
OCS-DM-COM-ICD-0048	Alert Production Complete Event

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EFD Transformation SW		(product in: Prompt SW Prod.)	
Manager	**Owner**	**WBS**	**Team**
Frossie Economou	Simon Krughoff		SQuaRE
	Short name: **EFD Transform** - Product key: **EFDT**		

This SW is the one used for Image and EFD Archiving in the Archive services. (EFD Extract-Tranform-Load) Software still to be implemented.

Uses:	**Used in:**
	EFD Cache
	EFD Transformation

Related Requirements

DMS-REQ-0004	Nightly Data Accessible Within Specified Time
DMS-REQ-0008	Pipeline Availability
DMS-REQ-0102	Provide Engineering & Facility Database Archive
DMS-REQ-0165	Infrastructure Sizing for ”catching up”
DMS-REQ-0167	Incorporate Autonomics
DMS-REQ-0309	Raw Data Archiving Reliability
DMS-REQ-0314	Compute Platform Heterogeneity
DMS-REQ-0315	DMS Communication with OCS
DMS-REQ-0318	Data Management Unscheduled Downtime
DMS-REQ-0346	Data Availability
OCS-DM-COM-ICD-0003	Data Management CSC Command Response Model
OCS-DM-COM-ICD-0004	Data Management Exposed CSCs
OCS-DM-COM-ICD-0008	EFD Transformation Service CSC
OCS-DM-COM-ICD-0025	Expected Load of Queries from DM
OCS-DM-COM-ICD-0026	Engineering and Facilities Database Archiving by Data Management
OCS-DM-COM-ICD-0027	Multiple Physically Separated Copies
OCS-DM-COM-ICD-0028	Expected Data Volume
OCS-DM-COM-ICD-0029	Archive Latency
OCS-DM-COM-ICD-0030	EFD Transformation Service Interface

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Header Service SW		(product in: Prompt SW Prod.)	
Manager	**Owner**	**WBS**	**Team**
Michelle Butler	Robert Gruendl	1.02C.07.08	LDF
	Short name: **Header Srv SW** - Product key: **HEADER**		

This software product is developed by DM but is inteded to be used by external users. It is developed at University of Illinois (Urbana)

GitHub Packages:	lsst-dm/HeaderService	4.4

Uses:	**Used in:**
	Header Service

Related Requirements

DMS-REQ-0266	Exposure Catalog
OCS-DM-COM-ICD-0003	Data Management CSC Command Response Model
OCS-DM-COM-ICD-0009	Command Set Implementation by Data Management
OCS-DM-COM-ICD-0012	Start Command
OCS-DM-COM-ICD-0013	configure Successful Completion Response
OCS-DM-COM-ICD-0014	enable Command
OCS-DM-COM-ICD-0015	disable Command
OCS-DM-COM-ICD-0033	Header Service CSC
OCS-DM-COM-ICD-0034	Auxiliary Header Service CSC
OCS-DM-COM-ICD-0036	standby Command
OCS-DM-COM-ICD-0037	exit Command
OCS-DM-COM-ICD-0038	enterControl Command
OCS-DM-COM-ICD-0039	enterControl Successful Completion Response
OCS-DM-COM-ICD-0040	Command Completion Response
OCS-EFD-HS-0001	Fulfill requirements of a Commandable SAL Component (CSC)
OCS-EFD-HS-0002	Critical System
OCS-EFD-HS-0003	Write Headers for all images taken by all Cameras supported by LSST
OCS-EFD-HS-0004	Ability to capture metadata at the beginning of exposure
OCS-EFD-HS-0005	Ability to capture metadata during of exposure integration
OCS-EFD-HS-0006	Ability to capture metadata at end of readout
OCS-EFD-HS-0007	Write header and Publish Event after end of telemetry event

OCS-EFD-HS-0008	Write header and Publish Event within specified time of the end-of-telemetry Event
OCS-EFD-HS-0009	Adherence to the FITS Standard
OCS-EFD-HS-0010	Configuration of Header Keywords and source
OCS-EFD-HS-0011	Produce header even if some meta-data not avaiable
OCS-EFD-HS-0012	Publish an Event if monitoring detects any failure of the service.
OCS-EFD-HS-0013	Extract metadata from published configuration
OCS-EFD-HS-0014	Metadata Capture
OCS-EFD-HS-0015	Generate on-the-fly additional metadata as approved by the Project CCB.

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Image Ingest and Processing		(product in: Prompt SW Prod.)	
Manager	**Owner**	**WBS**	**Team**
Michelle Butler	Robert Gruendl	1.02C.07.08	LDF
	Short name: **Image Ingest SW** - Product key: **IIP**		

Image ingest and processing SW product.

This includes the

- DMCS, used to implements the Telemetry Gateway service;
- prompt processing framework to orchestrate prompt processing payloads.

GitHub Packages:	ctrl_iip	4.6

Uses:	**Used in:**
	Prompt Processing Ingest
	Telemetry Gateway
	Image Archiver
	Prompt Processing

Related Requirements

CA-DM-CON-ICD-0014	Provide science sensor data
CA-DM-CON-ICD-0015	Provide wavefront sensor data
CA-DM-CON-ICD-0016	Provide guide sensor data
CA-DM-CON-ICD-0017	Data Management load on image data interfaces
CA-DM-CON-ICD-0019	Camera engineering image data archiving service
DM-TS-CON-ICD-0002	Timing
DM-TS-CON-ICD-0007	Timing
DMS-REQ-0004	Nightly Data Accessible Within Specified Time
DMS-REQ-0008	Pipeline Availability
DMS-REQ-0018	Raw Science Image Data Acquisition
DMS-REQ-0020	Wavefront Sensor Data Acquisition
DMS-REQ-0022	Crosstalk Corrected Science Image Data Acquisition
DMS-REQ-0024	Raw Image Assembly

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DMS-REQ-0068	Raw Science Image Metadata
DMS-REQ-0099	Level 1 Performance Report Definition
DMS-REQ-0131	Calibration Images Available Within Specified Time
DMS-REQ-0165	Infrastructure Sizing for ”catching up”
DMS-REQ-0167	Incorporate Autonomics
DMS-REQ-0265	Guider Calibration Data Acquisition
DMS-REQ-0284	Level-1 Production Completeness
DMS-REQ-0294	Processing of Datasets
DMS-REQ-0301	Control of Level-1 Production
DMS-REQ-0309	Raw Data Archiving Reliability
DMS-REQ-0314	Compute Platform Heterogeneity
DMS-REQ-0315	DMS Communication with OCS
DMS-REQ-0318	Data Management Unscheduled Downtime
DMS-REQ-0321	Level 1 Processing of Special Programs Data
DMS-REQ-0344	Constraints on Level 1 Special Program Products Generation
DMS-REQ-0346	Data Availability
OCS-DM-COM-ICD-0003	Data Management CSC Command Response Model
OCS-DM-COM-ICD-0004	Data Management Exposed CSCs
OCS-DM-COM-ICD-0005	Main Camera Archiver
OCS-DM-COM-ICD-0006	Catch-up Archiver
OCS-DM-COM-ICD-0007	Prompt Processing CSC
OCS-DM-COM-ICD-0009	Command Set Implementation by Data Management
OCS-DM-COM-ICD-0012	Start Command
OCS-DM-COM-ICD-0013	configure Successful Completion Response
OCS-DM-COM-ICD-0014	enable Command
OCS-DM-COM-ICD-0015	disable Command
OCS-DM-COM-ICD-0032	Auxiliary Telescope Archiver CSC
OCS-DM-COM-ICD-0036	standby Command
OCS-DM-COM-ICD-0037	exit Command
OCS-DM-COM-ICD-0038	enterControl Command
OCS-DM-COM-ICD-0039	enterControl Successful Completion Response
OCS-DM-COM-ICD-0040	Command Completion Response
OCS-DM-COM-ICD-0043	Image Retrieval for Archiving Event
OCS-DM-COM-ICD-0044	Image Retrieval For Processing Event
OCS-DM-COM-ICD-0045	Image in OODS Event
OCS-DM-COM-ICD-0055	Archiver Resource Availability

OCS-DM-COM-ICD-0056 Prompt Processing Resource Availability

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Planned Observation Publication SW		(product in: Prompt SW Prod.)	
Manager	**Owner**	**WBS**	**Team**
Michelle Butler	Tim Jenness Kian-Tat Lim	1.02C.07.08	LDF
Short name: **Plan Obs Pub SW** - Product key: **OBSPUB**			

This software implements an unauthenticated, globally-accessible Web service that publishes telemetry from the OCS describing the next visit location and the tele- scope scheduler's predictions of its future observations.

[last reviewed: K.T. Lim - Apr. 2020]

Uses:	**Used in:**
	Planned Observation Publication

Related Requirements	
DMS-REQ-0353	Publishing predicted visit schedule

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OCPS SW		(product in: Prompt SW Prod.)	
Manager	**Owner**	**WBS**	**Team**
Kian-Tat Lim	Tim Jenness	1.02C.02.02	ARCH
	Short name: **OCS Pipeline SW** - Product key: **OCPS**		
DMTN-133	OCS driven data processing		

Pipeline execution commandable SAL component. To run some pipelines in operations.

Uses:	**Used in:**
	OCS Controlled Pipeline Service

Related Requirements

DMS-REQ-0008	Pipeline Availability
DMS-REQ-0101	Level 1 Calibration Report Definition
DMS-REQ-0131	Calibration Images Available Within Specified Time
DMS-REQ-0162	Pipeline Throughput
DMS-REQ-0265	Guider Calibration Data Acquisition
DMS-REQ-0289	Calibration Production Processing
DMS-REQ-0294	Processing of Datasets
DMS-REQ-0301	Control of Level-1 Production
DMS-REQ-0314	Compute Platform Heterogeneity
DMS-REQ-0315	DMS Communication with OCS
DMS-REQ-0318	Data Management Unscheduled Downtime
OCS-DM-COM-ICD-0003	Data Management CSC Command Response Model
OCS-DM-COM-ICD-0009	Command Set Implementation by Data Management
OCS-DM-COM-ICD-0012	Start Command
OCS-DM-COM-ICD-0013	configure Successful Completion Response
OCS-DM-COM-ICD-0014	enable Command
OCS-DM-COM-ICD-0015	disable Command
OCS-DM-COM-ICD-0035	OCS-Driven Batch CSC
OCS-DM-COM-ICD-0036	standby Command
OCS-DM-COM-ICD-0037	exit Command
OCS-DM-COM-ICD-0038	enterControl Command
OCS-DM-COM-ICD-0039	enterControl Successful Completion Response
OCS-DM-COM-ICD-0040	Command Completion Response

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Observatory Operations Data Service SW (product in: Prompt SW Prod.)

Manager	Owner	WBS	Team
Michelle Butler	Robert Gruendl	1.02C.07.08	LDF

Short name: **Obs Ops Data SW** - Product key: **OODS**

This software implements the Butler ingest of image and calibration data as well as the cache management for the Observatory Operations Data Service.

GitHub Packages:	lsst-dm/ctrl_oods	4.5

Uses:	Used in:
	Observatory Operations Data

Related Requirements

CA-DM-DAQ-ICD-0052	Correction constants for science sensors sourced by Data Management
DM-TS-CON-ICD-0003	Wavefront image archive access
DMS-REQ-0167	Incorporate Autonomics
DMS-REQ-0314	Compute Platform Heterogeneity
DMS-REQ-0318	Data Management Unscheduled Downtime
DMS-REQ-0346	Data Availability

2.3.2 Batch Production Software Products

Manager	Owner	WBS	Team
Michelle Butler			
Short name: **Batch Prod. SW P.** - Product key: **BPSWP**			

Software products to orchestrate the off-line data processing, NOT to be executed in a prompt manner.

Products included in this section:

- Campaign Management - CMPGN
- Workload/ Workflow Management - WLWF

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Campaign Management		(product in: Batch Prod. SW P.)	
Manager	**Owner**	**WBS**	**Team**
	Michelle Gower	1.02C.07.08	LDF
Short name: **Campaign Mgmt** - Product key: **CMPGN**			

This software product orchestrate the run of the science pipeline in a docker.

Uses:	**Used in:**

Related Requirements	
DMS-REQ-0008	Pipeline Availability
DMS-REQ-0156	Provide Pipeline Execution Services
DMS-REQ-0163	Re-processing Capacity
DMS-REQ-0167	Incorporate Autonomics
DMS-REQ-0294	Processing of Datasets
DMS-REQ-0302	Production Orchestration
DMS-REQ-0303	Production Monitoring
DMS-REQ-0304	Production Fault Tolerance
DMS-REQ-0314	Compute Platform Heterogeneity
DMS-REQ-0318	Data Management Unscheduled Downtime

Workload/ Workflow Management		(product in: Batch Prod. SW P.)	
Manager	**Owner**	**WBS**	**Team**
	Michelle Gower	1.02C.07.08	LDF
	Short name: **Workload/flow** - Product key: **WLWF**		

This software product orchestrates the run of the science pipeline in a docker.

Uses:	**Used in:**
	Batch Production

Related Requirements	
DMS-REQ-0008	Pipeline Availability
DMS-REQ-0156	Provide Pipeline Execution Services
DMS-REQ-0163	Re-processing Capacity
DMS-REQ-0167	Incorporate Autonomics
DMS-REQ-0294	Processing of Datasets
DMS-REQ-0302	Production Orchestration
DMS-REQ-0303	Production Monitoring
DMS-REQ-0304	Production Fault Tolerance
DMS-REQ-0308	Software Architecture to Enable Community Re-Use
DMS-REQ-0314	Compute Platform Heterogeneity
DMS-REQ-0318	Data Management Unscheduled Downtime
DMS-REQ-0386	a Archive Processing Provenance
DMS-REQ-0388	Provide Re-Run Tools
DMS-REQ-0389	Re-Runs on Similar Systems
DMS-REQ-0390	Re-Runs on Other Systems

2.3.3 Quality Control Software Products

Manager	Owner	WBS	Team
Frossie Economou	Simon Krughoff		
	Short name: **QC SW Products** - Product key: **QCSWP**		

SW products for quality control.

Products included in this section:

- Quality Control SW - QCSW

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Quality Control SW		(product in: QC SW Products)	
Manager	**Owner**	**WBS**	**Team**
Frossie Economou	Simon Krughoff	1.02C.10.02.01	SQuaRE
	Short name: **Quality Ctrl SW** - Product key: **QCSW**		

This software product is used to instantiate the quality control services.

GitHub Packages:	lsst-sqre/squash	4.8

Uses:	**Used in:**
	Offline Quality Control
	Prompt Quality Control

Related Requirements

DMS-REQ-0096	Generate Data Quality Report Within Specified Time
DMS-REQ-0097	Level 1 Data Quality Report Definition
DMS-REQ-0098	Generate DMS Performance Report Within Specified Time
DMS-REQ-0099	Level 1 Performance Report Definition
DMS-REQ-0100	Generate Calibration Report Within Specified Time
DMS-REQ-0101	Level 1 Calibration Report Definition
DMS-REQ-0314	Compute Platform Heterogeneity
DMS-REQ-0318	Data Management Unscheduled Downtime

2.3.4 Backbone Software Products

Manager	Owner	WBS	Team
Michelle Butler			
	Short name: **Backbone SW P.** - Product key: **BBSWP**		

Software products that implement the Data Backbone services

Products included in this section:

- DBB Lifetime Management SW - DBBLIFE
- DBB Ingest/ Metadata Management SW - DBBMD
- DBB Transport/ Replication/ Backup SW - DBBTR

DBB Lifetime Management SW		(product in: Backbone SW P.)	
Manager	**Owner**	**WBS**	**Team**
	Michelle Gower	1.02C.07.08	LDF
Short name: **DBB Lifetime SW** - Product key: **DBBLIFE**			

This software product implements the management of the data in the science storage.

Uses:	**Used in:**
	DBB Lifetime Management

Related Requirements	
DMS-REQ-0310	Un-Archived Data Product Cache
DMS-REQ-0334	Persisting Data Products
DMS-REQ-0338	Targeted Coadds
DMS-REQ-0339	Tracking Characterization Changes Between Data Releases
DMS-REQ-0346	Data Availability

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DBB Ingest/ Metadata Management SW (product in: Backbone SW P.)

Manager	Owner	WBS	Team
	Michelle Gower	1.02C.07.08	LDF

Short name: **DBB Meta SW** - Product key: **DBBMD**

Listener in the Endpoint Data Backbone Enclave to provide ingestion services from the Facilities enclaves to the backbone.

GitHub Packages:	lsst-dm/dbb_gwclient	4.9
	lsst-dm/dbb_gateway	4.10

Uses:	Used in:
	DBB Ingest/ Metadata Management

Related Requirements

DMS-REQ-0008	Pipeline Availability
DMS-REQ-0068	Raw Science Image Metadata
DMS-REQ-0074	Difference Exposure Attributes
DMS-REQ-0077	Maintain Archive Publicly Accessible
DMS-REQ-0089	Solar System Objects Available Within Specified Time
DMS-REQ-0094	Keep Historical Alert Archive
DMS-REQ-0102	Provide Engineering & Facility Database Archive
DMS-REQ-0120	Level 3 Data Product Self Consistency
DMS-REQ-0122	Access to catalogs for external Level 3 processing
DMS-REQ-0123	Access to input catalogs for DAC-based Level 3 processing
DMS-REQ-0126	Access to images for external Level 3 processing
DMS-REQ-0127	Access to input images for DAC-based Level 3 processing
DMS-REQ-0130	Calibration Data Products
DMS-REQ-0131	Calibration Images Available Within Specified Time
DMS-REQ-0132	Calibration Image Provenance
DMS-REQ-0161	Optimization of Cost, Reliability and Availability in Order
DMS-REQ-0162	Pipeline Throughput
DMS-REQ-0163	Re-processing Capacity
DMS-REQ-0164	Temporary Storage for Communications Links
DMS-REQ-0165	Infrastructure Sizing for ”catching up”
DMS-REQ-0166	Incorporate Fault-Tolerance

DMS-REQ-0167	Incorporate Autonomics
DMS-REQ-0176	Base Facility Infrastructure
DMS-REQ-0185	Archive Center
DMS-REQ-0186	Archive Center Disaster Recovery
DMS-REQ-0197	No Limit on Data Access Centers
DMS-REQ-0266	Exposure Catalog
DMS-REQ-0269	DIASource Catalog
DMS-REQ-0271	DIAObject Catalog
DMS-REQ-0273	SSObject Catalog
DMS-REQ-0287	DIASource Precovery
DMS-REQ-0291	Query Repeatability
DMS-REQ-0292	Uniqueness of IDs Across Data Releases
DMS-REQ-0293	Selection of Datasets
DMS-REQ-0299	Data Product Ingest
DMS-REQ-0309	Raw Data Archiving Reliability
DMS-REQ-0310	Un-Archived Data Product Cache
DMS-REQ-0313	Level 1 & 2 Catalog Access
DMS-REQ-0314	Compute Platform Heterogeneity
DMS-REQ-0317	DIAForcedSource Catalog
DMS-REQ-0318	Data Management Unscheduled Downtime
DMS-REQ-0322	Special Programs Database
DMS-REQ-0334	Persisting Data Products
DMS-REQ-0338	Targeted Coadds
DMS-REQ-0339	Tracking Characterization Changes Between Data Releases
DMS-REQ-0346	Data Availability
DMS-REQ-0363	Access to Previous Data Releases
DMS-REQ-0364	Data Access Services
DMS-REQ-0365	Operations Subsets
DMS-REQ-0366	Subsets Support
DMS-REQ-0369	Evolution
DMS-REQ-0370	Older Release Behavior
OCS-DM-COM-ICD-0047	Image Archived Event

DBB Transport/ Replication/ Backup SW	(product in: Backbone SW P.)		
Manager	**Owner**	**WBS**	**Team**
	Michelle Gower	1.02C.07.08	LDF
	Short name: **DBB Transport SW** - Product key: **DBBTR**		

This software products will be used in the services to replicate data from different facilities and to send it to tape for long time preservation.

Uses:	**Used in:**
	DBB Transport/ Replication/ Backup
	DBB Storage

Related Requirements

DMS-REQ-0008	Pipeline Availability
DMS-REQ-0089	Solar System Objects Available Within Specified Time
DMS-REQ-0102	Provide Engineering & Facility Database Archive
DMS-REQ-0122	Access to catalogs for external Level 3 processing
DMS-REQ-0123	Access to input catalogs for DAC-based Level 3 processing
DMS-REQ-0126	Access to images for external Level 3 processing
DMS-REQ-0127	Access to input images for DAC-based Level 3 processing
DMS-REQ-0131	Calibration Images Available Within Specified Time
DMS-REQ-0161	Optimization of Cost, Reliability and Availability in Order
DMS-REQ-0162	Pipeline Throughput
DMS-REQ-0163	Re-processing Capacity
DMS-REQ-0164	Temporary Storage for Communications Links
DMS-REQ-0165	Infrastructure Sizing for ”catching up”
DMS-REQ-0166	Incorporate Fault-Tolerance
DMS-REQ-0167	Incorporate Autonomics
DMS-REQ-0185	Archive Center
DMS-REQ-0186	Archive Center Disaster Recovery
DMS-REQ-0197	No Limit on Data Access Centers
DMS-REQ-0287	DIASource Precovery
DMS-REQ-0309	Raw Data Archiving Reliability
DMS-REQ-0313	Level 1 & 2 Catalog Access
DMS-REQ-0314	Compute Platform Heterogeneity

DMS-REQ-0318	Data Management Unscheduled Downtime
DMS-REQ-0344	Constraints on Level 1 Special Program Products Generation
DMS-REQ-0366	Subsets Support
DMS-REQ-0370	Older Release Behavior

2.3.5 LSP Software Products

Manager	Owner	WBS	Team
Frossie Economou	Gregory Dubois-Felsmann		
	Short name: **LSP SW Products** - Product key: **LSPSWP**		
LDM-542	Science Platform Design		
LDM-554	Data Management LSST Science Platform Requirements		
LSE-319	LSST Science Platform Vision Document		
LDM-540	LSST Science Platform Test Specification		

Software products that implement the LSP services.

[last reviewed: G. Dubois-Felsmann - Feb 2020]

Products included in this section:

- LSP Portal Software - PRTLSW
- LSP Notebook Software - NBSW
- LSP Portal Online Help - PRTLOH
- Image/ Cutout Server - DAXIMG
- TAP Software - TAPSW

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LSP Portal Software		(product in: LSP SW Products)	
Manager	**Owner**	**WBS**	**Team**
Gregory Dubois-Felsmann	Gregory Dubois-Felsmann	1.02C.05.07 1.02C.05.08	SUIT
	Short name: **LSP Portal SW** - Product key: **PRTLSW**		
DMTN-136	LSST Science Platform Portal Aspect Design and Maintenance Manual		

Implements LSST Portal Aspect-specific behaviors added to the core Firefly library. Defines the Portal web application. Primarily JavaScript but also contains Java extensions (search processors) to the Firefly server side.

[last reviewed: G. Dubois-Felsmann - Feb 2020]

GitHub Packages:	suit	4.11

Uses:	**Used in:**
Firefly	LSP Portal

Related Requirements	
DMS-REQ-0119	Level 3 Resource Allocation Mechanism
DMS-REQ-0123	Access to input catalogs for DAC-based Level 3 processing
DMS-REQ-0124	Federation with external catalogs
DMS-REQ-0127	Access to input images for DAC-based Level 3 processing
DMS-REQ-0160	Provide User Interface Services
DMS-REQ-0161	Optimization of Cost, Reliability and Availability in Order
DMS-REQ-0193	Data Access Centers
DMS-REQ-0194	Data Access Center Simultaneous Connections
DMS-REQ-0197	No Limit on Data Access Centers
DMS-REQ-0314	Compute Platform Heterogeneity
DMS-REQ-0318	Data Management Unscheduled Downtime
DMS-REQ-0341	Providing a Precovery Service
DMS-REQ-0363	Access to Previous Data Releases
DMS-REQ-0364	Data Access Services
DMS-REQ-0365	Operations Subsets
DMS-REQ-0366	Subsets Support

DMS-REQ-0367	Access Services Performance
DMS-REQ-0368	Implementation Provisions
DMS-REQ-0369	Evolution
DMS-REQ-0370	Older Release Behavior
DMS-REQ-0371	Query Availability
DMS-REQ-0382	HiPS Visualization

LSP Notebook Software		(product in: LSP SW Products)	
Manager	**Owner**	**WBS**	**Team**
Frossie Economou	Simon Krughoff	1.02C.10.02.02	SQuaRE
Short name: **LSP Notebook SW** - Product key: **NBSW**			

Software product implementing the Rubin/LSST Nublado service.

GitHub Packages:	lsst-sqre/jupyterhubutils	4.12
	lsst-sqre/jupyterlabutils	4.13

Uses:	**Used in:**
Jupyterlab	LSP Nublado
Jupyterhub	

Related Requirements

DMS-REQ-0119	Level 3 Resource Allocation Mechanism
DMS-REQ-0123	Access to input catalogs for DAC-based Level 3 processing
DMS-REQ-0124	Federation with external catalogs
DMS-REQ-0127	Access to input images for DAC-based Level 3 processing
DMS-REQ-0161	Optimization of Cost, Reliability and Availability in Order
DMS-REQ-0193	Data Access Centers
DMS-REQ-0194	Data Access Center Simultaneous Connections
DMS-REQ-0197	No Limit on Data Access Centers
DMS-REQ-0314	Compute Platform Heterogeneity
DMS-REQ-0318	Data Management Unscheduled Downtime

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LSP Portal Online Help		(product in: LSP SW Products)	
Manager	**Owner**	**WBS**	**Team**
Gregory Dubois-Felsmann	Gregory Dubois-Felsmann	1.02C.05.08	SUIT
Short name: **Portal Online Help** - Product key: **PRTLOH**			

Contains help content, as HTML, and a small amount of GWT GUI code to implement a help application that provides a navigation sidebar for the HTML content.

[last reviewed: G. Dubois-Felsmann - Feb 2020]

GitHub Packages:	suit-onlinehelp	4.14

Uses:	**Used in:**
	LSP Portal

Related Requirements

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Image/ Cutout Server		(product in: LSP SW Products)	
Manager	**Owner**	**WBS**	**Team**
Frossie Economou	Colin Slater	1.02C.06.02.04	DAX
Short name: **Image Server SW** - Product key: **DAXIMG**			

Software product implementing the Rubin/LSST SODA image service.

GitHub Packages:	dax_imgserv	4.15

Uses:	**Used in:**
	SODA API

Related Requirements

DMS-REQ-0065	Provide Image Access Services
DMS-REQ-0127	Access to input images for DAC-based Level 3 processing
DMS-REQ-0155	Provide Data Access Services
DMS-REQ-0293	Selection of Datasets
DMS-REQ-0298	Data Product and Raw Data Access
DMS-REQ-0311	Regenerate Un-archived Data Products
DMS-REQ-0334	Persisting Data Products
DMS-REQ-0336	b Regenerating Data Products from Previous Data Releases
DMS-REQ-0338	Targeted Coadds
DMS-REQ-0339	Tracking Characterization Changes Between Data Releases
DMS-REQ-0346	Data Availability
DMS-REQ-0368	Implementation Provisions
EP-DM-CON-ICD-0013	Visualization Image Metadata Standard
EP-DM-CON-ICD-0034	Citizen Science Data

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TAP Software		(product in: LSP SW Products)	
Manager	**Owner**	**WBS**	**Team**
Frossie Economou	Simon Krughoff		
	Short name: **TAP Software** - Product key: **TAPSW**		

Software product implementing the Rubin/LSST TAP API service.

Uses:	**Used in:**
	TAP API

Related Requirements

2.3.6 Science Pipeline Software Products

Manager	Owner	WBS	Team
Yusra AlSayyad	Leanne Guy		
Short name: **Sci Pipelines SW P.** - Product key: **SCIPSWP**			
LDM-151	Data Management Science Pipelines Design		

DM Software products that implements the Science Pipelines payloads.

Products included in this section:

- Alert Production - APPRMPT
- Calibration Software - DMCAL
- Data Release Production - DRP
- Solar System processing and Forced Photometry - SSP
- Special Programs Productions - SP
- Template Generation - TMPLGEN
- Science Plugins - SPLUG
- SPL Workflow - SPLWF
- Science Pipelines Distribution - SPDIST

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Alert Production (product in: Sci Pipelines SW P.)

Manager	Owner	WBS	Team
Yusra AlSayyad	Eric Bellm	1.02C.03	AP

Short name: **Alert Prod SW** - Product key: **APPRMPT**

Software product for Allert Production processing.

GitHub Packages: ap_pipe 4.16

Uses:	Used in:
Science Pipelines Libraries	Prompt Processing Science Pipelines Distribution

Related Requirements

DMS-REQ-0002	Transient Alert Distribution
DMS-REQ-0004	Nightly Data Accessible Within Specified Time
DMS-REQ-0009	Simulated Data
DMS-REQ-0010	Difference Exposures
DMS-REQ-0029	Generate Photometric Zeropoint for Visit Image
DMS-REQ-0030	Generate WCS for Visit Images
DMS-REQ-0032	Image Differencing
DMS-REQ-0033	Provide Source Detection Software
DMS-REQ-0042	Provide Astrometric Model
DMS-REQ-0043	Provide Calibrated Photometry
DMS-REQ-0052	Enable a Range of Shape Measurement Approaches
DMS-REQ-0069	Processed Visit Images
DMS-REQ-0070	Generate PSF for Visit Images
DMS-REQ-0072	Processed Visit Image Content
DMS-REQ-0074	Difference Exposure Attributes
DMS-REQ-0097	Level 1 Data Quality Report Definition
DMS-REQ-0266	Exposure Catalog
DMS-REQ-0269	DIASource Catalog
DMS-REQ-0270	Faint DIASource Measurements
DMS-REQ-0271	DIAObject Catalog
DMS-REQ-0272	DIAObject Attributes

DMS-REQ-0274	Alert Content
DMS-REQ-0285	Level 1 Source Association
DMS-REQ-0288	Use of External Orbit Catalogs
DMS-REQ-0308	Software Architecture to Enable Community Re-Use
DMS-REQ-0312	Level 1 Data Product Access
DMS-REQ-0317	DIAForcedSource Catalog
DMS-REQ-0319	Characterizing Variability
DMS-REQ-0321	Level 1 Processing of Special Programs Data
DMS-REQ-0324	Matching DIASources to Objects
DMS-REQ-0327	Background Model Calculation
DMS-REQ-0328	Documenting Image Characterization
DMS-REQ-0333	Maximum Likelihood Values and Covariances
DMS-REQ-0344	Constraints on Level 1 Special Program Products Generation
DMS-REQ-0347	Measurements in catalogs
EP-DM-CON-ICD-0013	Visualization Image Metadata Standard
EP-DM-CON-ICD-0023	Nightly DM Transfer of Processed Visit Images (PVI)-Based Images to EPO
OCS-DM-COM-ICD-0049	WCS Information
OCS-DM-COM-ICD-0050	PSF Information
OCS-DM-COM-ICD-0051	Photometric Zeropoint Information
OCS-DM-COM-ICD-0052	Number of Alerts Information

Rubin Observatory

Calibration Software		(product in: Sci Pipelines SW P.)	
Manager	**Owner**	**WBS**	**Team**
Yusra AlSayyad	Robert Lupton	1.02C.04.02	DRP
	Short name: **Calibration SW** - Product key: **DMCAL**		

Software product for generating calibration data products.

GitHub Packages:	cp_pipe	4.17

Uses:	**Used in:**
Science Pipelines Libraries	Prompt Processing
	Batch Production
	Science Pipelines Distribution

Related Requirements	
DMS-REQ-0101	Level 1 Calibration Report Definition
DMS-REQ-0131	Calibration Images Available Within Specified Time
DMS-REQ-0265	Guider Calibration Data Acquisition
DMS-REQ-0308	Software Architecture to Enable Community Re-Use

Rubin Observatory

Data Release Production (product in: Sci Pipelines SW P.)

Manager	Owner	WBS	Team
Yusra AlSayyad	Jim Bosch	1.02C.04	DRP

Short name: **DR Prod SW** - Product key: **DRP**

Software product for data release production.

Uses:	Used in:
Science Pipelines Libraries	Batch Production
	Science Pipelines Distribution

Related Requirements

DMS-REQ-0009	Simulated Data
DMS-REQ-0032	Image Differencing
DMS-REQ-0033	Provide Source Detection Software
DMS-REQ-0034	Associate Sources to Objects
DMS-REQ-0042	Provide Astrometric Model
DMS-REQ-0043	Provide Calibrated Photometry
DMS-REQ-0046	Provide Photometric Redshifts of Galaxies
DMS-REQ-0047	Provide PSF for Coadded Images
DMS-REQ-0052	Enable a Range of Shape Measurement Approaches
DMS-REQ-0103	Produce Images for EPO
DMS-REQ-0106	Coadded Image Provenance
DMS-REQ-0267	Source Catalog
DMS-REQ-0268	Forced-Source Catalog
DMS-REQ-0275	Object Catalog
DMS-REQ-0276	Object Characterization
DMS-REQ-0277	Coadd Source Catalog
DMS-REQ-0278	Coadd Image Method Constraints
DMS-REQ-0279	Deep Detection Coadds
DMS-REQ-0280	Template Coadds
DMS-REQ-0281	Multi-band Coadds
DMS-REQ-0308	Software Architecture to Enable Community Re-Use
DMS-REQ-0320	Processing of Data From Special Programs
DMS-REQ-0325	Regenerating L1 Data Products During Data Release Processing
DMS-REQ-0326	Storing Approximations of Per-pixel Metadata

DMS-REQ-0329	All-Sky Visualization of Data Releases
DMS-REQ-0330	Best Seeing Coadds
DMS-REQ-0331	Computing Derived Quantities
DMS-REQ-0333	Maximum Likelihood Values and Covariances
DMS-REQ-0335	PSF-Matched Coadds
DMS-REQ-0337	Detecting faint variable objects
DMS-REQ-0347	Measurements in catalogs
DMS-REQ-0349	Detecting extended low surface brightness objects
DMS-REQ-0350	Associating Objects across data releases
DMS-REQ-0379	Produce All-Sky HiPS Map
DMS-REQ-0381	HiPS Linkage to Coadds
DMS-REQ-0383	Produce MOC Maps
EP-DM-CON-ICD-0013	Visualization Image Metadata Standard
EP-DM-CON-ICD-0014	Color Co-Add Image Format

Rubin Observatory

Solar System processing and Forced Photometry (product in: Sci Pipelines SW P.)

Manager	Owner	WBS	Team
Yusra AlSayyad	Eric Bellm	1.02C.03.06	AP

Short name: **SSP SW** - Product key: **SSP**

Software product for MOPS and Forced Photometry data processing.

GitHub Packages: mops_daymops 4.18

Uses:	Used in:
Science Pipelines Libraries	Prompt Processing
	Batch Production
	Science Pipelines Distribution

Related Requirements

DMS-REQ-0004	Nightly Data Accessible Within Specified Time
DMS-REQ-0089	Solar System Objects Available Within Specified Time
DMS-REQ-0273	SSObject Catalog
DMS-REQ-0286	SSObject Precovery
DMS-REQ-0287	DIASource Precovery
DMS-REQ-0288	Use of External Orbit Catalogs
DMS-REQ-0308	Software Architecture to Enable Community Re-Use
DMS-REQ-0317	DIAForcedSource Catalog
DMS-REQ-0319	Characterizing Variability
DMS-REQ-0321	Level 1 Processing of Special Programs Data
DMS-REQ-0341	Providing a Precovery Service
DMS-REQ-0344	Constraints on Level 1 Special Program Products Generation

Special Programs Productions		(product in: Sci Pipelines SW P.)	
Manager	**Owner**	**WBS**	**Team**
Yusra AlSayyad	Leanne Guy	1.02C.03	AP
		1.02C.04	DRP
Short name: **Spec Prog SW** - Product key: **SP**			

Software product for special programs data processing.

Uses:	**Used in:**
Science Pipelines Libraries	Batch Production
	Science Pipelines Distribution

Related Requirements	
DMS-REQ-0320	Processing of Data From Special Programs
DMS-REQ-0322	Special Programs Database

Rubin Observatory

Template Generation (product in: Sci Pipelines SW P.)

Manager	Owner	WBS	Team
Yusra AlSayyad	Jim Bosch	1.02C.04.04	DRP

Short name: **Tmpl Gen SW** - Product key: **TMPLGEN**

Uses:	Used in:
	Science Pipelines Distribution

Related Requirements

DMS-REQ-0280	Template Coadds
DMS-REQ-0308	Software Architecture to Enable Community Re-Use

Rubin Observatory

Science Plugins (product in: Sci Pipelines SW P.)

Manager	Owner	WBS	Team
Yusra AlSayyad	Leanne Guy	1.02C.04.02	DRP

Short name: **Science Plugins** - Product key: **SPLUG**

This software product includes all Science Pipelines plugin packages. A top level meta-package need to be defined, and all corresponding plugins shall to be a dependency in it. Definition: a plugin is any piece of software that meets a well-defined interface standard and can be configured in or out of the processing by the user.

Uses:	Used in:
	Science Pipelines Distribution

Related Requirements

DMS-REQ-0059	Bad Pixel Map
DMS-REQ-0060	Bias Residual Image
DMS-REQ-0061	Crosstalk Correction Matrix
DMS-REQ-0062	Illumination Correction Frame
DMS-REQ-0063	Monochromatic Flatfield Data Cube
DMS-REQ-0100	Generate Calibration Report Within Specified Time
DMS-REQ-0101	Level 1 Calibration Report Definition
DMS-REQ-0130	Calibration Data Products
DMS-REQ-0131	Calibration Images Available Within Specified Time
DMS-REQ-0132	Calibration Image Provenance
DMS-REQ-0265	Guider Calibration Data Acquisition
DMS-REQ-0282	Dark Current Correction Frame
DMS-REQ-0283	Fringe Correction Frame
DMS-REQ-0289	Calibration Production Processing
DMS-REQ-0308	Software Architecture to Enable Community Re-Use

Rubin Observatory

SPL Workflow		(product in: Sci Pipelines SW P.)	
Manager	**Owner**	**WBS**	**Team**

Short name: **SPL Workflow** - Product key: **SPLWF**

Uses:	**Used in:**

Related Requirements

Rubin Observatory

Science Pipelines Distribution (product in: Sci Pipelines SW P.)

Manager	Owner	WBS	Team
Yusra AlSayyad	Leanne Guy	1.02C.04.02	

Short name: **Science P. Dist.** - Product key: **SPDIST**

Top level distribution product for the Science Pipelines.

GitHub Packages:	lsst_distrib	4.19

Uses:	**Used in:**
Alert Production	
Calibration Software	
Data Release Production	
Solar System processing and Forced Photometry	
Special Programs Productions	
Science Plugins	LSP Nublado
Template Generation	
Data Butler	
Science Pipelines Libraries	
Task Framework	
Astrometry.net Data	
SciencePipelines Conda Env.	

Related Requirements

CA-DM-DAQ-ICD-0052	Correction constants for science sensors sourced by Data Management
DMS-REQ-0059	Bad Pixel Map
DMS-REQ-0060	Bias Residual Image
DMS-REQ-0061	Crosstalk Correction Matrix
DMS-REQ-0062	Illumination Correction Frame
DMS-REQ-0063	Monochromatic Flatfield Data Cube
DMS-REQ-0130	Calibration Data Products
DMS-REQ-0132	Calibration Image Provenance
DMS-REQ-0265	Guider Calibration Data Acquisition
DMS-REQ-0282	Dark Current Correction Frame
DMS-REQ-0283	Fringe Correction Frame

DMS-REQ-0289	Calibration Production Processing
DMS-REQ-0308	Software Architecture to Enable Community Re-Use

2.3.7 Supporting Software Products

Manager	Owner	WBS	Team
Yusra AlSayyad			
Short name: **Supporting SW P.** - Product key: **SPSWP**			

DM software products used as libraries and shared between different other DM software products.

Products included in this section:

- Science Pipelines Libraries - SCIPIPE
- Data Butler - BUTLER
- Task Framework - TXF
- Distributed Database - QSERV
- ADQL Translator - ADQL

Rubin Observatory

Science Pipelines Libraries		(product in: Supporting SW P.)	
Manager	**Owner**	**WBS**	**Team**
Yusra AlSayyad	Jim Bosch	1.02C.04	DRP
		1.02C.03	AP
Short name: **Sci Pipelines Libs** - Product key: **SCIPIPE**			

Science Pipeline library product. This product contains all software packages used, as a dependency, in all Science Pipelines application products (payloads).

GitHub Packages:	lsst_apps	4.20

Uses:	**Used in:**
	Alert Production
	Calibration Software
	Data Release Production
	Solar System processing and Forced Photometry
	Special Programs Productions
	Science Pipelines Distribution

Related Requirements

DM-TS-CON-ICD-0008	LSST Stack Availability
DMS-REQ-0032	Image Differencing
DMS-REQ-0033	Provide Source Detection Software
DMS-REQ-0042	Provide Astrometric Model
DMS-REQ-0043	Provide Calibrated Photometry
DMS-REQ-0052	Enable a Range of Shape Measurement Approaches
DMS-REQ-0296	Pre-cursor, and Real Data
DMS-REQ-0308	Software Architecture to Enable Community Re-Use
DMS-REQ-0351	Provide Beam Projector Coordinate Calculation Software

Rubin Observatory

Data Butler		(product in: Supporting SW P.)	
Manager	**Owner**	**WBS**	**Team**
Tim Jenness	Jim Bosch	1.02C.06.02.01	DAX
	Short name: **Data Butler** - Product key: **BUTLER**		
LDM-152	Data Management Middleware Design		

Butler middleware software product.

GitHub Packages:	daf_butler	4.21

Uses:	**Used in:**
	Science Pipelines Distribution

Related Requirements

DMS-REQ-0121	Provenance for Level 3 processing at DACs
DMS-REQ-0125	Software framework for Level 3 catalog processing
DMS-REQ-0128	Software framework for Level 3 image processing
DMS-REQ-0293	Selection of Datasets
DMS-REQ-0295	Transparent Data Access
DMS-REQ-0296	Pre-cursor, and Real Data
DMS-REQ-0308	Software Architecture to Enable Community Re-Use
DMS-REQ-0314	Compute Platform Heterogeneity
EP-DM-CON-ICD-0035	DM Software

Rubin Observatory

Task Framework		(product in: Supporting SW P.)	
Manager	**Owner**	**WBS**	**Team**
Tim Jenness	Tim Jenness	1.02C.06.03	DAX
	Short name: **Task Framework** - Product key: **TXF**		

SuperTask middleware software product.

GitHub Packages:	pipe_supertask	4.22

Uses:	**Used in:**
	Science Pipelines Distribution

Related Requirements

DMS-REQ-0121	Provenance for Level 3 processing at DACs
DMS-REQ-0125	Software framework for Level 3 catalog processing
DMS-REQ-0128	Software framework for Level 3 image processing
DMS-REQ-0158	Provide Pipeline Construction Services
DMS-REQ-0294	Processing of Datasets
DMS-REQ-0304	Production Fault Tolerance
DMS-REQ-0305	Task Specification
DMS-REQ-0306	Task Configuration
DMS-REQ-0308	Software Architecture to Enable Community Re-Use
DMS-REQ-0314	Compute Platform Heterogeneity
DMS-REQ-0320	Processing of Data From Special Programs
EP-DM-CON-ICD-0035	DM Software

Rubin Observatory

Distributed Database		(product in: Supporting SW P.)	
Manager	**Owner**	**WBS**	**Team**
Fritz Mueller	Colin Slater	1.02C.06.02.03	DAX
	Short name: **Distrib Database** - Product key: **QSERV**		
DMTN-022	Tracks to optimize Qserv containers deployment and orchestration		
LDM-135	Data Management Database Design		

Distributed database software product.
It will be used to implement the database used by the LSP to serve the release catalog data.

[last reviewed: F.Mueller - Jan 2020]

GitHub Packages:	qserv	4.23

Uses:	**Used in:**
	LSP Database

Related Requirements

DMS-REQ-0046	Provide Photometric Redshifts of Galaxies
DMS-REQ-0075	Catalog Queries
DMS-REQ-0077	Maintain Archive Publicly Accessible
DMS-REQ-0267	Source Catalog
DMS-REQ-0268	Forced-Source Catalog
DMS-REQ-0275	Object Catalog
DMS-REQ-0276	Object Characterization
DMS-REQ-0277	Coadd Source Catalog
DMS-REQ-0290	Level 3 Data Import
DMS-REQ-0291	Query Repeatability
DMS-REQ-0292	Uniqueness of IDs Across Data Releases
DMS-REQ-0293	Selection of Datasets
DMS-REQ-0313	Level 1 & 2 Catalog Access
DMS-REQ-0322	Special Programs Database
DMS-REQ-0331	Computing Derived Quantities
DMS-REQ-0332	Denormalizing Database Tables

DMS-REQ-0333	Maximum Likelihood Values and Covariances
DMS-REQ-0340	Access Controls of Level 3 Data Products
DMS-REQ-0345	Logging of catalog queries
DMS-REQ-0347	Measurements in catalogs
DMS-REQ-0350	Associating Objects across data releases
DMS-REQ-0363	Access to Previous Data Releases
DMS-REQ-0365	Operations Subsets
DMS-REQ-0366	Subsets Support
DMS-REQ-0367	Access Services Performance
DMS-REQ-0368	Implementation Provisions
DMS-REQ-0369	Evolution
DMS-REQ-0370	Older Release Behavior
DMS-REQ-0371	Query Availability

Rubin Observatory

ADQL Translator (product in: Supporting SW P.)

Manager	Owner	WBS	Team
Frossie Economou	Simon Krughoff	1.02C.06.02.05	DAX

Short name: **ADQL Translator** - Product key: **ADQL**

[OBSOLETE]
DAX Query Services in Kotlin.

GitHub Packages:	albuquery	4.24

Uses:	Used in:

Related Requirements

DMS-REQ-0075	Catalog Queries
DMS-REQ-0078	Catalog Export Formats
DMS-REQ-0123	Access to input catalogs for DAC-based Level 3 processing
DMS-REQ-0155	Provide Data Access Services
DMS-REQ-0291	Query Repeatability
DMS-REQ-0298	Data Product and Raw Data Access
DMS-REQ-0322	Special Programs Database
DMS-REQ-0323	Calculating SSObject Parameters
DMS-REQ-0331	Computing Derived Quantities
DMS-REQ-0340	Access Controls of Level 3 Data Products
DMS-REQ-0345	Logging of catalog queries
DMS-REQ-0364	Data Access Services
DMS-REQ-0368	Implementation Provisions
DMS-REQ-0369	Evolution
EP-DM-CON-ICD-0034	Citizen Science Data

2.3.8 Environments

Manager	Owner	WBS	Team
Kian-Tat Lim			
	Short name: **Environments** - Product key: **ENVS**		

This section provides the list of Conda environments used for operations. The environments are not properly software products, but due to the way they are defined, they are treated as software products in the global picture.

Products included in this section:

- SciencePipelines Conda Env. - SPLCE

Rubin Observatory

SciencePipelines Conda Env.		(product in: Environments)	
Manager	**Owner**	**WBS**	**Team**
	Tim Jenness		
	Short name: **SPL Conda Env** - Product key: **SPLCE**		

This environment is used to build and execute the pipelines. It should not provide any other packages required by the downstream user. However, since the use of stacked environments is not yet consolidated, historically, some extra packages have been included.

GitHub Packages:	scipipe_conda_env	4.25

Uses:	**Used in:**
	Science Pipelines Distribution

Related Requirements

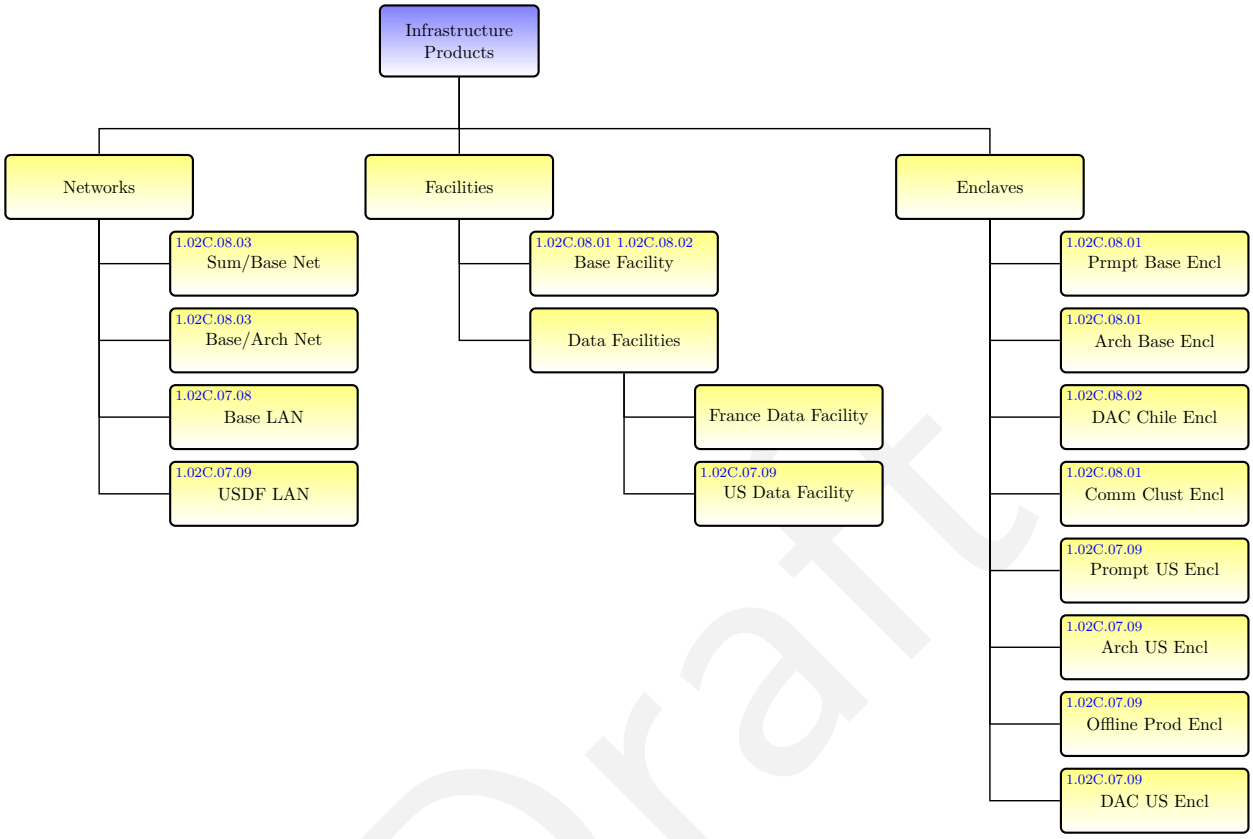
2.4 Infrastructure Products

Manager	Owner	WBS	Team
Wil O'Mullane			
Short name: **Infrastructure** - Product key: **INFRA**			
LDM-129	LSST Data Facility Logical Information Technology and Communications Design		

DM infrastructural products.

This part of the product tree includes:

- Network Infrastructures
- Physical Facilities
- Enclaves


Infrastructure Products
Networks
Facilities
Enclaves
1.02C.08.03 Sum/Base Net
1.02C.08.03 Base/Arch Net
1.02C.07.08 Base LAN
1.02C.07.09 USDF LAN
1.02C.08.01 1.02C.08.02 Base Facility
Data Facilities
France Data Facility
1.02C.07.09 US Data Facility
1.02C.08.01 Prmpt Base Encl
1.02C.08.01 Arch Base Encl
1.02C.08.02 DAC Chile Encl
1.02C.08.01 Comm Clust Encl
1.02C.07.09 Prompt US Encl
1.02C.07.09 Arch US Encl
1.02C.07.09 Offline Prod Encl
1.02C.07.09 DAC US Encl

2.4.1 Networks

Manager	Owner	WBS	Team

Short name: **Networks** - Product key: **NET**

LSE-78	LSST Observatory Network Design

High level physical DM networks definition.

Products included in this section:

- Summit to Base Network - NETSB
- Base to Archive Network - NETBA
- Base LAN Network - NETBASE
- USDF LAN Network - NETUSDF

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Summit to Base Network		(product in: Networks)	
Manager	**Owner**	**WBS**	**Team**
Jeff Kantor	Jeff Kantor	1.02C.08.03	Net/Base
	Short name: **Sum/Base Net** - Product key: **NETSB**		

La Serena - AURA Gatehouse Network

Uses:	**Used in:**

Related Requirements	
DMS-REQ-0165	Infrastructure Sizing for ”catching up”
DMS-REQ-0166	Incorporate Fault-Tolerance
DMS-REQ-0167	Incorporate Autonomics
DMS-REQ-0168	Summit Facility Data Communications
DMS-REQ-0171	Summit to Base Network
DMS-REQ-0172	Summit to Base Network Availability
DMS-REQ-0173	Summit to Base Network Reliability
DMS-REQ-0174	Summit to Base Network Secondary Link
DMS-REQ-0175	Summit to Base Network Ownership and Operation
OCS-DM-COM-ICD-0053	Summit-Base Network Utilization

Rubin Observatory

Base to Archive Network (product in: Networks)

Manager	Owner	WBS	Team
Jeff Kantor	Jeff Kantor	1.02C.08.03	Net/Base

Short name: **Base/Arch Net** - Product key: **NETBA**

Uses:	Used in:

Related Requirements

DMS-REQ-0165	Infrastructure Sizing for ”catching up”
DMS-REQ-0166	Incorporate Fault-Tolerance
DMS-REQ-0167	Incorporate Autonomics
DMS-REQ-0180	Base to Archive Network
DMS-REQ-0181	Base to Archive Network Availability
DMS-REQ-0182	Base to Archive Network Reliability
DMS-REQ-0183	Base to Archive Network Secondary Link
DMS-REQ-0188	Archive to Data Access Center Network
DMS-REQ-0189	Archive to Data Access Center Network Availability
DMS-REQ-0190	Archive to Data Access Center Network Reliability
DMS-REQ-0191	Archive to Data Access Center Network Secondary Link
OCS-DM-COM-ICD-0054	Base-Archive Network Utilization

Rubin Observatory

Base LAN Network		(product in: Networks)	
Manager	**Owner**	**WBS**	**Team**
Cristian Silva	Wil O'Mullane	1.02C.07.08	LDF
Short name: **Base LAN** - Product key: **NETBASE**			

Base Local Area Network.

Uses:	**Used in:**

Related Requirements	
DMS-REQ-0165	Infrastructure Sizing for "catching up"
DMS-REQ-0166	Incorporate Fault-Tolerance
DMS-REQ-0167	Incorporate Autonomics
DMS-REQ-0193	Data Access Centers
DMS-REQ-0194	Data Access Center Simultaneous Connections
DMS-REQ-0352	Base Wireless LAN (WiFi)

Rubin Observatory

USDF LAN Network		(product in: Networks)	
Manager	**Owner**	**WBS**	**Team**
Michelle Butler	Wil O'Mullane	1.02C.07.09	LDF
Short name: **USDF LAN** - Product key: **NETUSDF**			

NCSA Local Area Network.

Uses:	**Used in:**

Related Requirements	
DMS-REQ-0163	Re-processing Capacity
DMS-REQ-0165	Infrastructure Sizing for "catching up"
DMS-REQ-0166	Incorporate Fault-Tolerance
DMS-REQ-0167	Incorporate Autonomics
DMS-REQ-0188	Archive to Data Access Center Network
DMS-REQ-0189	Archive to Data Access Center Network Availability
DMS-REQ-0190	Archive to Data Access Center Network Reliability
DMS-REQ-0191	Archive to Data Access Center Network Secondary Link
DMS-REQ-0193	Data Access Centers
DMS-REQ-0194	Data Access Center Simultaneous Connections

2.4.2 Facilities

Manager	Owner	WBS	Team

Short name: **Facilities** - Product key: **FAC**

Physical facilities where operational DM activities take place.

Products included in this section:

- Base Facility - FACBASE

Base Facility		(product in: Facilities)	
Manager	**Owner**	**WBS**	**Team**
Cristian Silva	Wil O'Mullane	1.02C.08.01 1.02C.08.02	Net/Base
	Short name: **Base Facility** - Product key: **FACBASE**		

Base facility located at La Serena, Chile.

Uses:	**Used in:**
Archive Base Enclave	
DAC Chile Enclave	
Commissioning Cluster Enclave	
Prompt Base Enclave	

Related Requirements

DM-TS-CON-ICD-0003	Wavefront image archive access
DMS-REQ-0008	Pipeline Availability
DMS-REQ-0161	Optimization of Cost, Reliability and Availability in Order
DMS-REQ-0162	Pipeline Throughput
DMS-REQ-0163	Re-processing Capacity
DMS-REQ-0164	Temporary Storage for Communications Links
DMS-REQ-0165	Infrastructure Sizing for "catching up"
DMS-REQ-0166	Incorporate Fault-Tolerance
DMS-REQ-0167	Incorporate Autonomics
DMS-REQ-0170	Prefer Computing and Storage Down
DMS-REQ-0176	Base Facility Infrastructure
DMS-REQ-0178	Base Facility Co-Location with Existing Facility
DMS-REQ-0193	Data Access Centers
DMS-REQ-0196	Data Access Center Geographical Distribution
DMS-REQ-0297	DMS Initialization Component
DMS-REQ-0314	Compute Platform Heterogeneity
DMS-REQ-0315	DMS Communication with OCS
DMS-REQ-0316	Commissioning Cluster
DMS-REQ-0318	Data Management Unscheduled Downtime
DMS-REQ-0352	Base Wireless LAN (WiFi)
OCS-DM-COM-ICD-0027	Multiple Physically Separated Copies

2.4.2.1 Data Facilities

Manager	Owner	WBS	Team

Short name: **Data Facilities** - Product key: **DF**

Data Facilities is where data processing is performed.

Products included in this section:

- French Data Facility - FACFR
- US Data Facility - FACUS

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French Data Facility (product in: Data Facilities)

Manager	Owner	WBS	Team

Short name: **France Data Facility** - Product key: **FACFR**

Uses:	Used in:
DAC Satellite Enclave	
Production Satellite Enclave	

Related Requirements

Rubin Observatory

US Data Facility		(product in: Data Facilities)	
Manager	**Owner**	**WBS**	**Team**
Michelle Butler	Wil O'Mullane	1.02C.07.09	LDF
	Short name: **US Data Facility** - Product key: **FACUS**		

NCSA processing facility located at Urbana, Illinois(USA).

Uses:	**Used in:**
DAC US Enclave	
Offline Production Enclave	
Development and Integration E.	
Prompt US Enclave	
Archive US Enclave	

Related Requirements

DM-TS-CON-ICD-0003	Wavefront image archive access
DMS-REQ-0008	Pipeline Availability
DMS-REQ-0161	Optimization of Cost, Reliability and Availability in Order
DMS-REQ-0162	Pipeline Throughput
DMS-REQ-0163	Re-processing Capacity
DMS-REQ-0164	Temporary Storage for Communications Links
DMS-REQ-0165	Infrastructure Sizing for "catching up"
DMS-REQ-0166	Incorporate Fault-Tolerance
DMS-REQ-0167	Incorporate Autonomics
DMS-REQ-0170	Prefer Computing and Storage Down
DMS-REQ-0185	Archive Center
DMS-REQ-0186	Archive Center Disaster Recovery
DMS-REQ-0187	Archive Center Co-Location with Existing Facility
DMS-REQ-0193	Data Access Centers
DMS-REQ-0196	Data Access Center Geographical Distribution
DMS-REQ-0297	DMS Initialization Component
DMS-REQ-0314	Compute Platform Heterogeneity
DMS-REQ-0318	Data Management Unscheduled Downtime
EP-DM-CON-ICD-0001	US DAC Provides EPO Interface
OCS-DM-COM-ICD-0027	Multiple Physically Separated Copies

2.4.3 Enclaves

Manager	Owner	WBS	Team

Short name: **Enclaves** - Product key: **ENC**

The enclaves are a logical way to group services in a specific context. They represent the place where a service is instantiated. The same service, for example LSP, may be instantiate in multiple enclaves.

Products included in this section:

- Prompt Base Enclave - ENCPRB
- Archive Base Enclave - ENCARCB
- DAC Chile Enclave - ENCDACC
- Commissioning Cluster Enclave - ENCCOMM
- Prompt US Enclave - ENCPRUS
- Archive US Enclave - ENCARCUS
- Offline Production Enclave - ENCOFFL
- DAC US Enclave - ENCDACU

Rubin Observatory

Prompt Base Enclave (product in: Enclaves)

Manager	Owner	WBS	Team
Cristian Silva	Wil O'Mullane	1.02C.08.01	LDF

Short name: **Prmpt Base Encl** - Product key: **ENCPRB**

This product groups all services required to be executed in a nearly real time manner, at Base facility. This includes sending data to NCSA over the long haul network for immediate feed to services for processing and alert generation.

Uses:	Used in:
Prompt Processing Ingest	
Telemetry Gateway	
Planned Observation Publication	
OCS Controlled Pipeline Service	
Observatory Operations Data	Base Facility
Archiving [Obsolete]	
EFD Cache	
Image Archiver	
Header Service	
EFD Transformation	

Related Requirements

CA-DM-CON-ICD-0007	Provide Data Management Conditions data
CA-DM-CON-ICD-0008	Data Management Conditions data latency
CA-DM-CON-ICD-0019	Camera engineering image data archiving service
DM-TS-CON-ICD-0002	Timing
DM-TS-CON-ICD-0003	Wavefront image archive access
DM-TS-CON-ICD-0007	Timing
DMS-REQ-0004	Nightly Data Accessible Within Specified Time
DMS-REQ-0008	Pipeline Availability
DMS-REQ-0096	Generate Data Quality Report Within Specified Time
DMS-REQ-0098	Generate DMS Performance Report Within Specified Time
DMS-REQ-0100	Generate Calibration Report Within Specified Time
DMS-REQ-0102	Provide Engineering & Facility Database Archive
DMS-REQ-0161	Optimization of Cost, Reliability and Availability in Order

DMS-REQ-0162	Pipeline Throughput
DMS-REQ-0164	Temporary Storage for Communications Links
DMS-REQ-0165	Infrastructure Sizing for ”catching up”
DMS-REQ-0166	Incorporate Fault-Tolerance
DMS-REQ-0167	Incorporate Autonomics
DMS-REQ-0176	Base Facility Infrastructure
DMS-REQ-0284	Level-1 Production Completeness
DMS-REQ-0309	Raw Data Archiving Reliability
DMS-REQ-0314	Compute Platform Heterogeneity
DMS-REQ-0315	DMS Communication with OCS
DMS-REQ-0318	Data Management Unscheduled Downtime
DMS-REQ-0353	Publishing predicted visit schedule
OCS-DM-COM-ICD-0004	Data Management Exposed CSCs
OCS-DM-COM-ICD-0025	Expected Load of Queries from DM
OCS-DM-COM-ICD-0026	Engineering and Facilities Database Archiving by Data Management
OCS-DM-COM-ICD-0027	Multiple Physically Separated Copies
OCS-DM-COM-ICD-0028	Expected Data Volume
OCS-DM-COM-ICD-0030	EFD Transformation Service Interface

Rubin Observatory

Archive Base Enclave (product in: Enclaves)

Manager	Owner	WBS	Team
Cristian Silva	Wil O'Mullane	1.02C.08.01	LDF

Short name: **Arch Base Encl** - Product key: **ENCARCB**

This product groups all archive services (Data BackBone) located at the Base facility.

Uses:	Used in:
DBB Ingest/ Metadata Management	Base Facility
DBB Transport/ Replication/ Backup	
DBB Lifetime Management	
DBB Storage	

Related Requirements

CA-DM-CON-ICD-0019	Camera engineering image data archiving service
DM-TS-CON-ICD-0003	Wavefront image archive access
DMS-REQ-0004	Nightly Data Accessible Within Specified Time
DMS-REQ-0029	Generate Photometric Zeropoint for Visit Image
DMS-REQ-0030	Generate WCS for Visit Images
DMS-REQ-0069	Processed Visit Images
DMS-REQ-0077	Maintain Archive Publicly Accessible
DMS-REQ-0078	Catalog Export Formats
DMS-REQ-0089	Solar System Objects Available Within Specified Time
DMS-REQ-0094	Keep Historical Alert Archive
DMS-REQ-0102	Provide Engineering & Facility Database Archive
DMS-REQ-0106	Coadded Image Provenance
DMS-REQ-0131	Calibration Images Available Within Specified Time
DMS-REQ-0161	Optimization of Cost, Reliability and Availability in Order
DMS-REQ-0162	Pipeline Throughput
DMS-REQ-0163	Re-processing Capacity
DMS-REQ-0166	Incorporate Fault-Tolerance
DMS-REQ-0167	Incorporate Autonomics
DMS-REQ-0176	Base Facility Infrastructure
DMS-REQ-0186	Archive Center Disaster Recovery
DMS-REQ-0266	Exposure Catalog
DMS-REQ-0267	Source Catalog

DMS-REQ-0268	Forced-Source Catalog
DMS-REQ-0269	DIASource Catalog
DMS-REQ-0270	Faint DIASource Measurements
DMS-REQ-0271	DIAObject Catalog
DMS-REQ-0272	DIAObject Attributes
DMS-REQ-0273	SSObject Catalog
DMS-REQ-0274	Alert Content
DMS-REQ-0275	Object Catalog
DMS-REQ-0284	Level-1 Production Completeness
DMS-REQ-0287	DIASource Precovery
DMS-REQ-0309	Raw Data Archiving Reliability
DMS-REQ-0310	Un-Archived Data Product Cache
DMS-REQ-0314	Compute Platform Heterogeneity
DMS-REQ-0317	DIAForcedSource Catalog
DMS-REQ-0318	Data Management Unscheduled Downtime
DMS-REQ-0322	Special Programs Database
DMS-REQ-0327	Background Model Calculation
DMS-REQ-0334	Persisting Data Products
DMS-REQ-0344	Constraints on Level 1 Special Program Products Generation
DMS-REQ-0363	Access to Previous Data Releases
DMS-REQ-0364	Data Access Services
DMS-REQ-0365	Operations Subsets
DMS-REQ-0366	Subsets Support
DMS-REQ-0367	Access Services Performance
DMS-REQ-0368	Implementation Provisions
DMS-REQ-0370	Older Release Behavior
OCS-DM-COM-ICD-0027	Multiple Physically Separated Copies
OCS-DM-COM-ICD-0028	Expected Data Volume
OCS-DM-COM-ICD-0029	Archive Latency

Rubin Observatory

DAC Chile Enclave		(product in: Enclaves)	
Manager	**Owner**	**WBS**	**Team**
Cristian Silva	Wil O'Mullane	1.02C.08.02	LDF
Short name: **DAC Chile Encl** - Product key: **ENCDACC**			

This product groups all DAC services required for nominal operations, located at the Base facility.

Uses:	**Used in:**
LSP Nublado	
LSP Portal	
WebDAV API	
SIA API	Base Facility
SODA API	
TAP API	
LSP Database	

Related Requirements

DMS-REQ-0004	Nightly Data Accessible Within Specified Time
DMS-REQ-0077	Maintain Archive Publicly Accessible
DMS-REQ-0089	Solar System Objects Available Within Specified Time
DMS-REQ-0094	Keep Historical Alert Archive
DMS-REQ-0102	Provide Engineering & Facility Database Archive
DMS-REQ-0119	Level 3 Resource Allocation Mechanism
DMS-REQ-0131	Calibration Images Available Within Specified Time
DMS-REQ-0161	Optimization of Cost, Reliability and Availability in Order
DMS-REQ-0162	Pipeline Throughput
DMS-REQ-0166	Incorporate Fault-Tolerance
DMS-REQ-0167	Incorporate Autonomics
DMS-REQ-0176	Base Facility Infrastructure
DMS-REQ-0193	Data Access Centers
DMS-REQ-0194	Data Access Center Simultaneous Connections
DMS-REQ-0196	Data Access Center Geographical Distribution
DMS-REQ-0284	Level-1 Production Completeness
DMS-REQ-0287	DIASource Precovery

DMS-REQ-0309	Raw Data Archiving Reliability
DMS-REQ-0310	Un-Archived Data Product Cache
DMS-REQ-0311	Regenerate Un-archived Data Products
DMS-REQ-0312	Level 1 Data Product Access
DMS-REQ-0313	Level 1 & 2 Catalog Access
DMS-REQ-0314	Compute Platform Heterogeneity
DMS-REQ-0318	Data Management Unscheduled Downtime
DMS-REQ-0322	Special Programs Database
DMS-REQ-0334	Persisting Data Products
DMS-REQ-0336	b Regenerating Data Products from Previous Data Releases
DMS-REQ-0341	Providing a Precovery Service
DMS-REQ-0344	Constraints on Level 1 Special Program Products Generation
DMS-REQ-0363	Access to Previous Data Releases
DMS-REQ-0364	Data Access Services
DMS-REQ-0365	Operations Subsets
DMS-REQ-0366	Subsets Support
DMS-REQ-0367	Access Services Performance
DMS-REQ-0368	Implementation Provisions
DMS-REQ-0370	Older Release Behavior
OCS-DM-COM-ICD-0029	Archive Latency

Rubin Observatory

Commissioning Cluster Enclave (product in: Enclaves)

Manager	Owner	WBS	Team
Frossie Economou	Simon Krughoff	1.02C.08.01	LDF

Short name: **Comm Clust Encl** - Product key: **ENCCOMM**

This product groups all DAC services required for Commissioning, at the Base facility.

Uses:	Used in:
LSP Portal	
LSP Nublado	
WebDAV API	
SIA API	Base Facility
SODA API	
TAP API	
LSP Database	

Related Requirements

DMS-REQ-0161	Optimization of Cost, Reliability and Availability in Order
DMS-REQ-0166	Incorporate Fault-Tolerance
DMS-REQ-0167	Incorporate Autonomics
DMS-REQ-0176	Base Facility Infrastructure
DMS-REQ-0314	Compute Platform Heterogeneity
DMS-REQ-0316	Commissioning Cluster
DMS-REQ-0318	Data Management Unscheduled Downtime

Rubin Observatory

Prompt US Enclave (product in: Enclaves)

Manager	Owner	WBS	Team
Michelle Butler	Wil O'Mullane	1.02C.07.09	LDF

Short name: **Prompt US Encl** - Product key: **ENCPRUS**

This product groups all services required to be executed in a nearly real time manner, at NCSA facility.

Uses:	Used in:
Alert Distribution	US Data Facility
Prompt Processing Ingest	
Offline Quality Control	
Prompt Quality Control	
Prompt Processing	
APDB	

Related Requirements

CA-DM-CON-ICD-0019	Camera engineering image data archiving service
DMS-REQ-0002	Transient Alert Distribution
DMS-REQ-0004	Nightly Data Accessible Within Specified Time
DMS-REQ-0008	Pipeline Availability
DMS-REQ-0096	Generate Data Quality Report Within Specified Time
DMS-REQ-0098	Generate DMS Performance Report Within Specified Time
DMS-REQ-0100	Generate Calibration Report Within Specified Time
DMS-REQ-0102	Provide Engineering & Facility Database Archive
DMS-REQ-0131	Calibration Images Available Within Specified Time
DMS-REQ-0161	Optimization of Cost, Reliability and Availability in Order
DMS-REQ-0162	Pipeline Throughput
DMS-REQ-0165	Infrastructure Sizing for "catching up"
DMS-REQ-0166	Incorporate Fault-Tolerance
DMS-REQ-0167	Incorporate Autonomics
DMS-REQ-0284	Level-1 Production Completeness
DMS-REQ-0314	Compute Platform Heterogeneity
DMS-REQ-0318	Data Management Unscheduled Downtime
EP-DM-CON-ICD-0023	Nightly DM Transfer of Processed Visit Images (PVI)-Based Images to EPO

Rubin Observatory

Archive US Enclave (product in: Enclaves)

Manager	Owner	WBS	Team
Michelle Butler	Wil O'Mullane	1.02C.07.09	LDF

Short name: **Arch US Encl** - Product key: **ENCARCUS**

This product groups all archive services (Data BackBone) located at the NCSA facility.

Uses:	Used in:
DBB Ingest/ Metadata Management	US Data Facility
DBB Lifetime Management	
DBB Storage	
DBB Transport/ Replication/ Backup	

Related Requirements

CA-DM-CON-ICD-0019	Camera engineering image data archiving service
DM-TS-CON-ICD-0003	Wavefront image archive access
DMS-REQ-0004	Nightly Data Accessible Within Specified Time
DMS-REQ-0029	Generate Photometric Zeropoint for Visit Image
DMS-REQ-0030	Generate WCS for Visit Images
DMS-REQ-0069	Processed Visit Images
DMS-REQ-0077	Maintain Archive Publicly Accessible
DMS-REQ-0078	Catalog Export Formats
DMS-REQ-0089	Solar System Objects Available Within Specified Time
DMS-REQ-0094	Keep Historical Alert Archive
DMS-REQ-0102	Provide Engineering & Facility Database Archive
DMS-REQ-0106	Coadded Image Provenance
DMS-REQ-0131	Calibration Images Available Within Specified Time
DMS-REQ-0161	Optimization of Cost, Reliability and Availability in Order
DMS-REQ-0162	Pipeline Throughput
DMS-REQ-0163	Re-processing Capacity
DMS-REQ-0166	Incorporate Fault-Tolerance
DMS-REQ-0167	Incorporate Autonomics
DMS-REQ-0185	Archive Center
DMS-REQ-0186	Archive Center Disaster Recovery
DMS-REQ-0266	Exposure Catalog
DMS-REQ-0267	Source Catalog

DMS-REQ-0268	Forced-Source Catalog
DMS-REQ-0269	DIASource Catalog
DMS-REQ-0271	DIAObject Catalog
DMS-REQ-0272	DIAObject Attributes
DMS-REQ-0273	SSObject Catalog
DMS-REQ-0274	Alert Content
DMS-REQ-0275	Object Catalog
DMS-REQ-0284	Level-1 Production Completeness
DMS-REQ-0287	DIASource Precovery
DMS-REQ-0309	Raw Data Archiving Reliability
DMS-REQ-0310	Un-Archived Data Product Cache
DMS-REQ-0312	Level 1 Data Product Access
DMS-REQ-0314	Compute Platform Heterogeneity
DMS-REQ-0317	DIAForcedSource Catalog
DMS-REQ-0318	Data Management Unscheduled Downtime
DMS-REQ-0322	Special Programs Database
DMS-REQ-0334	Persisting Data Products
DMS-REQ-0344	Constraints on Level 1 Special Program Products Generation
DMS-REQ-0363	Access to Previous Data Releases
DMS-REQ-0364	Data Access Services
DMS-REQ-0365	Operations Subsets
DMS-REQ-0366	Subsets Support
DMS-REQ-0367	Access Services Performance
DMS-REQ-0368	Implementation Provisions
DMS-REQ-0370	Older Release Behavior
OCS-DM-COM-ICD-0027	Multiple Physically Separated Copies
OCS-DM-COM-ICD-0028	Expected Data Volume
OCS-DM-COM-ICD-0029	Archive Latency

Rubin Observatory

Offline Production Enclave		(product in: Enclaves)	
Manager	**Owner**	**WBS**	**Team**
Michelle Butler	Wil O'Mullane	1.02C.07.09	LDF
Short name: **Offline Prod Encl** - Product key: **ENCOFFL**			

This product groups all processing services to be executed offline, at the NCSA facility.

Uses:	**Used in:**
Batch Production	
Offline Quality Control	US Data Facility
Bulk Distribution	

Related Requirements

DM-TS-CON-ICD-0003	Wavefront image archive access
DMS-REQ-0004	Nightly Data Accessible Within Specified Time
DMS-REQ-0008	Pipeline Availability
DMS-REQ-0131	Calibration Images Available Within Specified Time
DMS-REQ-0161	Optimization of Cost, Reliability and Availability in Order
DMS-REQ-0162	Pipeline Throughput
DMS-REQ-0163	Re-processing Capacity
DMS-REQ-0166	Incorporate Fault-Tolerance
DMS-REQ-0167	Incorporate Autonomics
DMS-REQ-0284	Level-1 Production Completeness
DMS-REQ-0289	Calibration Production Processing
DMS-REQ-0314	Compute Platform Heterogeneity
DMS-REQ-0318	Data Management Unscheduled Downtime
DMS-REQ-0320	Processing of Data From Special Programs
DMS-REQ-0334	Persisting Data Products
DMS-REQ-0341	Providing a Precovery Service
EP-DM-CON-ICD-0037	EPO Compute Cluster

Rubin Observatory

DAC US Enclave		(product in: Enclaves)	
Manager	**Owner**	**WBS**	**Team**
Michelle Butler	Wil O'Mullane	1.02C.07.09	LDF
	Short name: **DAC US Encl** - Product key: **ENCDACU**		

This product groups all DAC services required for operations, located at the NCSA facility.

`https://github.com/lsst-sqre/lsp-deploy`

Uses:	**Used in:**
LSP Nublado	
LSP Portal	
WebDAV API	
SIA API	US Data Facility
SODA API	
TAP API	
LSP Database	

Related Requirements

DMS-REQ-0004	Nightly Data Accessible Within Specified Time
DMS-REQ-0077	Maintain Archive Publicly Accessible
DMS-REQ-0089	Solar System Objects Available Within Specified Time
DMS-REQ-0094	Keep Historical Alert Archive
DMS-REQ-0102	Provide Engineering & Facility Database Archive
DMS-REQ-0119	Level 3 Resource Allocation Mechanism
DMS-REQ-0131	Calibration Images Available Within Specified Time
DMS-REQ-0161	Optimization of Cost, Reliability and Availability in Order
DMS-REQ-0162	Pipeline Throughput
DMS-REQ-0166	Incorporate Fault-Tolerance
DMS-REQ-0167	Incorporate Autonomics
DMS-REQ-0193	Data Access Centers
DMS-REQ-0194	Data Access Center Simultaneous Connections
DMS-REQ-0196	Data Access Center Geographical Distribution

DMS-REQ-0284	Level-1 Production Completeness
DMS-REQ-0287	DIASource Precovery
DMS-REQ-0310	Un-Archived Data Product Cache
DMS-REQ-0311	Regenerate Un-archived Data Products
DMS-REQ-0312	Level 1 Data Product Access
DMS-REQ-0313	Level 1 & 2 Catalog Access
DMS-REQ-0314	Compute Platform Heterogeneity
DMS-REQ-0318	Data Management Unscheduled Downtime
DMS-REQ-0322	Special Programs Database
DMS-REQ-0334	Persisting Data Products
DMS-REQ-0336	b Regenerating Data Products from Previous Data Releases
DMS-REQ-0341	Providing a Precovery Service
DMS-REQ-0344	Constraints on Level 1 Special Program Products Generation
DMS-REQ-0363	Access to Previous Data Releases
DMS-REQ-0364	Data Access Services
DMS-REQ-0366	Subsets Support
DMS-REQ-0367	Access Services Performance
DMS-REQ-0368	Implementation Provisions
DMS-REQ-0370	Older Release Behavior
EP-DM-CON-ICD-0001	US DAC Provides EPO Interface
EP-DM-CON-ICD-0002	EPO is an Authorized Science User
EP-DM-CON-ICD-0034	Citizen Science Data
OCS-DM-COM-ICD-0029	Archive Latency

3 Supporting products

This section will list all DM products that are not involved in the operational data processing activities. However these products have an important role for construction and maintenance.

These products are organized and maintained in MagicDraw by the DM System Engineering group.

3.1 DM Development and Maintenance products

Manager	Owner	WBS	Team

Short name: **DM Support Products** - Product key: **DMDEV**

Following sections provide an overview on products that are used ony for development activities.

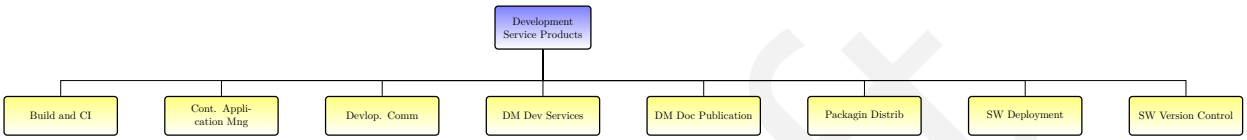
The product tree graph for DMDEV is available at this link .

3.2 Development Service Products

Manager	Owner	WBS	Team

Short name: **Support Services** - Product key: **DMDSRV**

Services required by the DM developers.



Rubin Observatory

Build/ CI		(product in: Support Services)	
Manager	**Owner**	**WBS**	**Team**

Short name: **Build and CI** - Product key: **BCI**

Build and Continuous Integration services, This service is running the compilation and the unit test continuously, in order to ensure that latest changes introduced in the repository do not affect the compilation nor the functionality. Continuous Integration is not only exercise in a single software package, but ensure that all packages together are still building and provides nightly and weekly a working build as tags in the git repository and as EUPS distribution packages. Documents are build continuously using the same approach.

Uses:	**Used in:**
Jenkins	
jenkins scripting	

Related Requirements

Rubin Observatory

Containerized Application Management (product in: Support Services)

Manager	Owner	WBS	Team

Short name: **Cont. Application Mng** - Product key: **CAM**

To be described.

Uses:	Used in:
Kubernetes	
Docker	

Related Requirements

Rubin Observatory

Developer Communication Tools		(product in: Support Services)	
Manager	**Owner**	**WBS**	**Team**

Short name: **Devlop. Comm** - Product key: **DMDCOM**

Developer Communication Service (SLACK?)

Uses:	**Used in:**

Related Requirements

Rubin Observatory

Developer Services		(product in: Support Services)	
Manager	**Owner**	**WBS**	**Team**

Short name: **DM Dev Services** - Product key: **DDVSRV**

This service includes all required at NCSA in order to develop and maintain the DMS components.

Uses:	**Used in:**
	Development and Integration E.

Related Requirements

Rubin Observatory

Documentation Publication		(product in: Support Services)	
Manager	**Owner**	**WBS**	**Team**

Short name: **DM Doc Publication** - Product key: **DDCPUB**

Documentation Publication service

Uses:	**Used in:**

Related Requirements

Packaging/ Distribution		(product in: Support Services)	
Manager	**Owner**	**WBS**	**Team**

Short name: **Packagin Distrib** - Product key: **PKGDST**

Packaging and Distribution Service Is not this service duplicated (partially at least) with SW Deployment Srv.?

Uses:	**Used in:**

Related Requirements

SW Deployment		(product in: Support Services)	
Manager	**Owner**	**WBS**	**Team**

Short name: **SW Deployment** - Product key: **DEPLOY**

This service provide the ability of DMS to deploy the different software packages in instantiated services in order to fulfill DMS objectives and requirements. This imply for example the capability to deploy for the general production DRP payload the corresponding science pipeline, with the proper version and configuration in order to process the data and provide the periodic data release. Different deployment strategies can be identified depending of the type of software and service. 3rd party software will be usually deployed manually.

Uses:	**Used in:**

Related Requirements

Rubin Observatory

SW Version Control		(product in: Support Services)	
Manager	**Owner**	**WBS**	**Team**

Short name: **SW Version Control** - Product key: **SWVER**

This service provides software release management in order to obtain consistent releases for the execution of the main DMS services that will provide the final data products required.

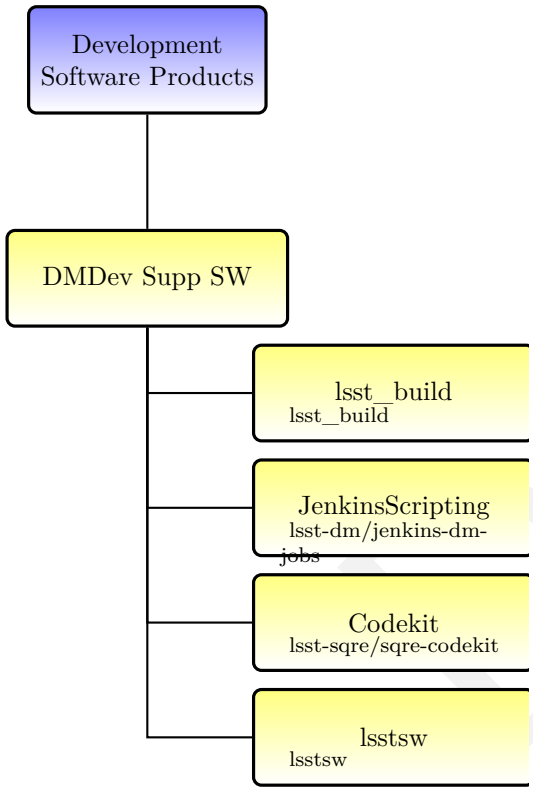
Uses:	**Used in:**
Github	

Related Requirements

3.3 Development Software Products

Manager	Owner	WBS	Team

Short name: **Dm Dev Software** - Product key: **DMDSW**



3.3.1 DevM Supporting SW

Manager	Owner	WBS	Team

Short name: **DMDev Supp SW** - Product key: **DMDSS**

Products included in this section:

- codekit - CDKT
- jenkins scripting - JSCR
- lsst_build - LBLD
- lsstsw - LSSTSW

Rubin Observatory

codekit		(product in: DMDev Supp SW)	
Manager	**Owner**	**WBS**	**Team**

Short name: **Codekit** - Product key: **CDKT**

GitHub Packages:	lsst-sqre/sqre-codekit	4.28

Uses:	**Used in:**

Related Requirements

Rubin Observatory

jenkins scripting		(product in: DMDev Supp SW)	
Manager	**Owner**	**WBS**	**Team**

Short name: **JenkinsScripting** - Product key: **JSCR**

Scripting implementing the Jenkins jobs

GitHub Packages:	lsst-dm/jenkins-dm-jobs	4.27

Uses:	**Used in:**
	Build/ CI

Related Requirements

Rubin Observatory

lsst_build		(product in: DMDev Supp SW)	
Manager	**Owner**	**WBS**	**Team**

Short name: **lsst_build** - Product key: **LBLD**

Builder and Continuous Integration Tools for LSST.

GitHub Packages:	lsst_build	4.26

Uses:	**Used in:**

Related Requirements

Rubin Observatory

lsstsw		(product in: DMDev Supp SW)	
Manager	**Owner**	**WBS**	**Team**

Short name: **lsstsw** - Product key: **LSSTSW**

GitHub Packages:	lsstsw	4.29

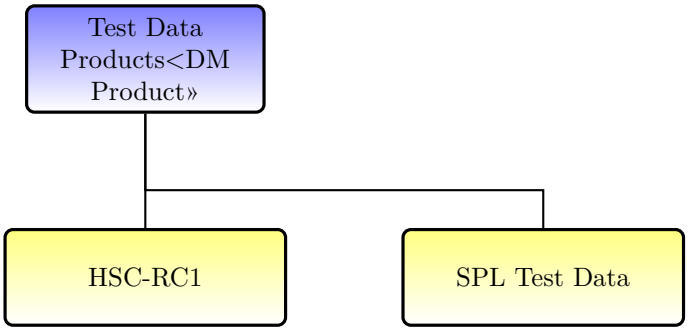
Uses:	**Used in:**

Related Requirements

3.4 Test Data Products<DM Product»

Manager	Owner	WBS	Team

Short name: **Test Data** - Product key: **DMDTDP**



Rubin Observatory

HSC-RC1		(product in: Test Data)	
Manager	**Owner**	**WBS**	**Team**

Short name: **HSC-RC1** - Product key: **HSCRC1**

Hyper Suprime-Cam ”RC1” This is an example of Dataset that can be included in this package. To be better characterized.

Uses:	**Used in:**

Related Requirements

Rubin Observatory

Science Pipelines Test Data		(product in: Test Data)	
Manager	**Owner**	**WBS**	**Team**

Short name: **SPL Test Data** - Product key: **SPLTD**

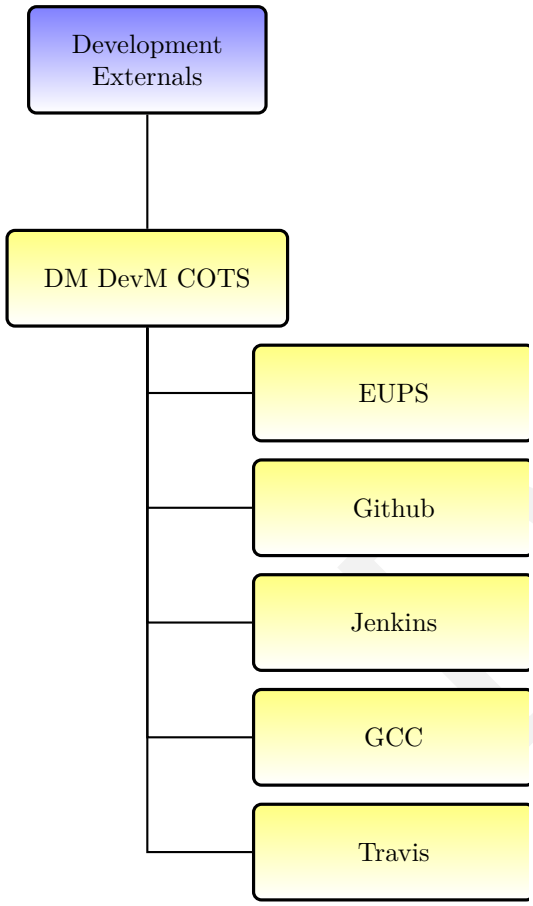
Uses:	**Used in:**

Related Requirements

3.5 Development Externals

Manager	Owner	WBS	Team

Short name: **COTS 3rdPLs ENVs** - Product key: **DMDC3E**



3.5.1 DevM COTS

Manager	Owner	WBS	Team

Short name: **DM DevM COTS** - Product key: **COTSDM**

Products included in this section:

- EUPS - EUPS
- GCC - GCC
- Github - GITHUB
- Jenkins - JNKNS
- Travis - TRVS

Rubin Observatory

EUPS		(product in: DM DevM COTS)	
Manager	**Owner**	**WBS**	**Team**

Short name: **EUPS** - Product key: **EUPS**

Uses:	**Used in:**

Related Requirements

Rubin Observatory

GCC		(product in: DM DevM COTS)	
Manager	**Owner**	**WBS**	**Team**

Short name: **GCC** - Product key: **GCC**

Uses:	**Used in:**

Related Requirements

Rubin Observatory

Github		(product in: DM DevM COTS)	
Manager	**Owner**	**WBS**	**Team**

Short name: **Github** - Product key: **GITHUB**

Uses:	**Used in:**
	SW Version Control

Related Requirements

Rubin Observatory

Jenkins		(product in: DM DevM COTS)	
Manager	**Owner**	**WBS**	**Team**

Short name: **Jenkins** - Product key: **JNKNS**

Uses:	**Used in:**
	Build/ CI

Related Requirements

Build/ CI

Rubin Observatory

Travis		(product in: DM DevM COTS)	
Manager	**Owner**	**WBS**	**Team**

Short name: **Travis** - Product key: **TRVS**

Uses:	**Used in:**

Related Requirements

4 GitHub Packages

This section lists the GitHub packages related to the DM products listed in previous sections 2 and 3. The detailed information is extracted from GitHub.

The information provided includes, when available, the list of dependencies tracted from the ups table file. Note that the release procedure as described in DMTN-106 can be applied to a software product only if all dependencies are not used in other software products. If this is not the case, only one of these software products can be released.

As it can be evinced by a quick inspection in the following subsections, all Science Pipelines software products share a large number of dependencies. Therefore, the only releasebale software product, at the time of writing (July 2020) is the Science Pipeline distribution.

4.1 nublado

JupyterLab + JupyterHub + k8s deployment used by LSST for its Science Platform

Open it in GitHUb:	https://github.com/lsst-sqre/nublado
Top Level Component:	LSP Nublado

README.md (First 20 lines only)

```
# Rubin Observatory Science Platform Notebook Aspect

## You Probably Should Not Use This

If what you want to do is simply deploy a Jupyter setup under Kubernetes
you're much better off
using
[Zero to JupyterHub](https://zero-to-jupyterhub.readthedocs.io/en/latest/),
which is an excellent general tutorial for setting up JupyterHub in a
Kubernetes environment.

This cluster is much more specifically tailored to the needs of
the [Rubin Observatory](https://rubinobservatory.org).  If you want an
example of how to set up persistent storage for your users, a worked
example of how to subclass a spawner or authenticator, or how to use a
custom image-spawner options menu, you may find it useful.

## Overview

The Rubin Observatory Science Platform Notebook Aspect is a JupyterHub +
```

4.2 lsst-tap-service

IVOA TAP service for LSST

Open it in GitHUb:	https://github.com/lsst-sqre/lsst-tap-service
Top Level Component:	TAP API

README.md (First 20 lines only)

```
# LSST TAP Service

This repository contains the LSST TAP service.  It is based on the CADC TAP service
code and uses this as a dependency, and then adds special logic to work with QServ.

## Build

Run ./build.sh

## Deployment

### Docker
After the [Build](#build) step above, a set of containers with the ‘dev‘ tag will exist
on your local machine.  Then when you run:

‘docker–compose up –d && ./waitForContainersReady.sh && ./checkAvailability.sh‘

This should start a local group of containers, wait for them to be ready, and then
check that the availability endpoint returns a 200 and a simple sync query works.
This validates that your local TAP implementation is working.  You can now either
```

4.3 davt

WebDAV with substitute user impersonation per-request

Open it in GitHUb:	https://github.com/lsst/davt
Top Level Component:	WebDAV API
GitHub Teams:	Overlords
	Data Management
	Database

README.md (First 20 lines only)

```
# davt

'davt' is a lua module for nginx to aid with impersonation. Its target use case is for use with
WebDAV, so that all operations are executed _as the user in the request_.

For every incoming request, davt enables nginx to switch the OS user (with 'setfsuid') and/or
group IDs/supplementary group IDs (via 'setfsgid', 'setgroups', 'initgroups') to match the
authenticated user or specific groups before performing any file opertions.

As davt enables impersonation, a few properties follow:

* The files do NOT need to be owned by an nginx service account user, nor does an ACL need to be
modified to allow for access to an service group (for filesystems supporting ACLs). This allows
you to transperently operate the service over existing directories.

* Ownership when creating files is preserved for the files in question. This ensures that files
created for the user via WebDAV are also readable when the user is in a shell, for example.

## Requirements
davt requires ljsyscall. It also used the ffi library from LuaJIT.
```

4.4 HeaderService

LSST Meta-data aggregator for FITS header service

Open it in GitHUb:	https://github.com/lsst-dm/HeaderService
Top Level Component:	Header Service SW

EUPS dependencies

name	description

README.md (First 20 lines only)

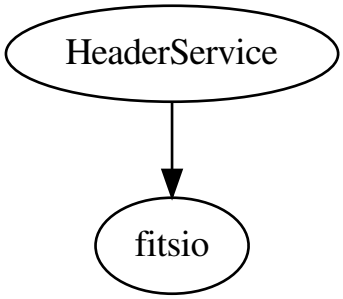
```
# HeaderService

Development for LSST Meta-data FITS header service

Description
-----------

This is the development for the LSST Meta-data FITS header client. It
uses a set of FITS header library templates and DDS/SAL Python-based
communication layer to populate meta-data and command the header
client to write header files.

Requirements
------------
+ numpy
+ astropy
+ fitsio (https://github.com/esheldon/fitsio)
+ salobj
+ OpenSplice compiled binaries for centOS7
+ A CentOS7 VM or docker container
```



4.5 ctrl_oods

Observatory Operations Data Service

Open it in GitHUb:	https://github.com/lsst-dm/ctrl_oods
Top Level Component:	Observatory Operations Data Service SW

EUPS dependencies

name	description
base	C++/Python import utilities and doxygen configuration for LSST Data Management. Also included in: **Alert Production, Calibration Software, Solar System processing and Forced Photometry, Science Pipelines Distribution, Science Pipelines Libraries, Data Butler, Task Framework, Distributed Database,**
sconsUtils	Build system for LSST Data Management packages with standard layout. Also included in: **Alert Production, Calibration Software, Solar System processing and Forced Photometry, Science Pipelines Distribution, Science Pipelines Libraries, Data Butler, Task Framework, Distributed Database,**
utils	Common code, floating-point utilities, and angle stringification for LSST Data Management. Also included in: **Alert Production, Calibration Software, Solar System processing and Forced Photometry, Science Pipelines Distribution, Science Pipelines Libraries, Data Butler, Task Framework, Distributed Database,**
pex_exceptions	Exception base classes and common exceptions, including C++-Python exception translation for LSST Data Management. Also included in: **Alert Production, Calibration Software, Solar System processing and Forced Photometry, Science Pipelines Distribution, Science Pipelines Libraries, Data Butler, Task Framework, Distributed Database,**
obs_lsst	The obs model for the LSST cameras
afw	LSST data management: pipeline library code and primitives including images and tables Also included in: **Alert Production, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries, Task Framework,**
daf_base	Low-level data structures, including memory-management helpers (Citizen), mappings (PropertySet, PropertyList), and DateTime. Also included in: **Alert Production, Calibration Software, Solar System processing and Forced Photometry, Science Pipelines Distribution, Science Pipelines Libraries, Task Framework,**

daf_persistence	Data access interface (the Butler) and deprecated persistence framework for LSST Data Management. Also included in: **Alert Production, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries, Task Framework,**
log	LSST DM Logging for C++ and Python Also included in: **Alert Production, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries, Task Framework, Distributed Database,**
pex_policy	Deprecated configuration interface for LSST Data Management (replaced by pex_config). Also included in: **Alert Production, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries, Task Framework,**
pex_config	Configuration interface and history-tracking for LSST Data Management. Also included in: **Alert Production, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries, Task Framework,**
geom	Low-level geometry primitives for LSST Data Management Also included in: **Alert Production, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries, Task Framework,**
sphgeom	C++ spherical geometry primitives for LSST Data Management Also included in: **Alert Production, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries, Data Butler, Task Framework, Distributed Database,**
astshim	C++ shim for a subset of the AST astronomical library Also included in: **Alert Production, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries, Task Framework,**
obs_base	Data access utilities and camera-specialization interfaces for LSST Data Management. Also included in: **Alert Production, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries,**
astro_metadata_translator	Observation metadata handling infrastructure Also included in: **Alert Production, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries,**
daf_butler	Prototype for data access framework described in DMTN-056 Also included in: **Alert Production, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries, Data Butler, Task Framework,**
pipe_base	LSST Data Management: base classes for data processing tasks Also included in: **Alert Production, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries, Task Framework,**
ip_isr	LSST data management: instrument signature removal (detrending) for astronomical images Also included in: **Calibration Software, Science Pipelines Distribution,**

meas_algorithms	LSST Data Management: astronomical measurement algorithms Also included in: **Alert Production, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries,**
meas_base	LSST Data Management: core astronomical measurement algorithms Also included in: **Alert Production, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries,**
coadd_utils	LSST data management: base classes for coadding (stacking) astronomical images Also included in: **Alert Production, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries,**
obs_test	Configuration and tasks for a test camera on the LSST Data Management Stack Also included in: **Alert Production, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries,**
obs_test_data	Repository to hold user curated data for obs_test Also included in: **Alert Production, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries,**
pipe_tasks	LSST Data Management: astronomical data processing tasks Also included in: **Alert Production, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries,**
meas_extensions_scarlet	Also included in: **Alert Production, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries,**
scarlet	Source separation in multi-band images by Constrained Matrix Factorization Also included in: **Alert Production, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries,**
proxmin	Proximal optimization in pure python Also included in: **Alert Production, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries,**
scarlet_extensions	Unofficial but useful methods and classes to use with scarlet Also included in: **Alert Production, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries,**
kht	Kernel-Based Hough Transform for Detecting Straight Lines in Images Also included in: **Alert Production, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries,**
eigen	Also included in: **Alert Production, Calibration Software, Solar System processing and Forced Photometry, Science Pipelines Distribution, Science Pipelines Libraries,**

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obs_lsst_data	A repository for storing versioned calibration data and camera geometry for LSST instruments.

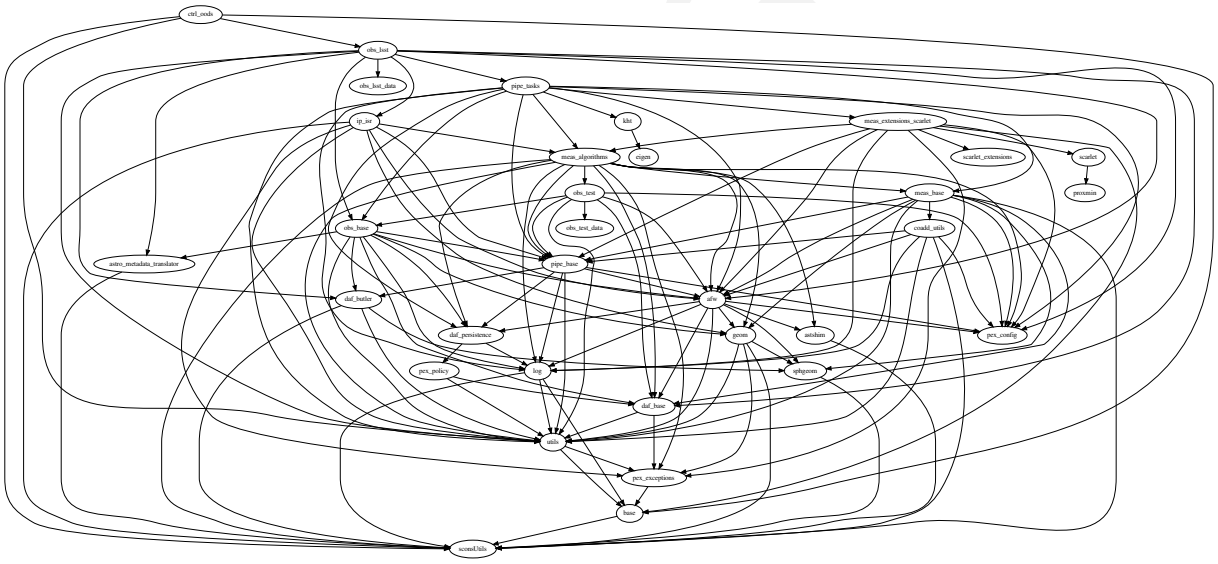
README.rst (First 20 lines only)

```
#########
ctrl_oods
#########

``ctrl_oods`` is an `LDF Prompt Enclave Software`_ package.

.. Add a brief (few sentence) description of what this package provides.

The Observatory Operations Data Service watches for files in one or more directories, and then
    ingests them into an LSST Butler repository.
Files are expired from the repository at specified intervals.
```



4.6 ctrl_iip

Image ingest and processing

Open it in GitHUb:	https://github.com/lsst/ctrl_iip
Top Level Component:	Image Ingest and Processing
GitHub Teams:	Data Management

README.md (First 20 lines only)

```
# ctrl_iip
Image ingest and processing

environment variables:

Set CTRL_IIP_DIR to the root of this repository. (this will be set automatically
when this is integrated with the DM system)

Set PYTHONPATH to include $CTRL_IPP_DIR/python



Note about configuration files:

Configuration files are loaded from $CTRL_IIP_DIR/etc/config by default

If the environment variable IIP_CONFIG_DIR is set, it will look in
this directory for configuration files.
```

4.7 alert_stream

Mock alert stream distribution system using Kafka producers and consumers.

Open it in GitHUb:	https://github.com/lsst-dm/alert_stream
Top Level Component:	Alert Distribution SW

README.rst (First 20 lines only)

```
############
alert_stream
############

This package implements the LSST Alert Distribution Service.
The Alert Distribution Service provides a mechanism for rapidly disseminating and filtering
    notifications of transient and variable sources observed by LSST.
The service is described in detail in `DMTN-093`_.

.. _DMTN-093: https://dmtn-093.lsst.io/

Prerequisites
=============

- Cloning this repository requires `Git LFS`_ (Large File Storage) support.
  Refer to the `DM Developer Guide`_ for more information.

.. _Git LFS: https://git-lfs.github.com
.. _DM Developer Guide: https://developer.lsst.io/git/git-lfs.html
```

4.8 squash

SQuaSH web interface

Open it in GitHUb:	https://github.com/lsst-sqre/squash
Top Level Component:	Quality Control SW

README.md (First 20 lines only)

```
# squash

'squash' is the web frontend to embed the bokeh apps and navigate through them. You can learn
    more about SQuaSH at [SQR-009](https://sqr-009.lsst.io).

[![Build Status](https://travis-ci.org/lsst-sqre/squash.svg?branch=master)](https://travis-ci.org
    /lsst-sqre/squash)

## Requirements

The 'squash' web frontend requires the [squash-restful-api](https://github.com/lsst-sqre/squash-
    restful-api) and [squash-bokeh](https://github.com/lsst-sqre/squash-bokeh) microservices, and
     the TLS certificats that are installed by the
['squash-deployment'](https://github.com/lsst-sqre/squash-deployment).

## Kubernetes deployment

You can provision a Kubernetes cluster in GKE, clone this repo and deploy the 'squash'
    microservice using:

'''
cd squash
TAG=latest make service deployment
'''
```

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4.9 dbb_gwclient

Prototype code to save raw files to Data Backbone Gateway

Open it in GitHUb:	https://github.com/lsst-dm/dbb_gwclient
Top Level Component:	DBB Ingest/ Metadata Management SW

README.md (First 20 lines only)

```
# dbb_gwclient
Prototype code to save raw files to Data Backbone Gateway.

This is a Python 3 only package (we assume Python 3.6 or higher).
```

4.10 dbb_gateway

Prototype code that ingests into the Data Backbone raw files delivered by the dbb_gwclient to the DBB gateway

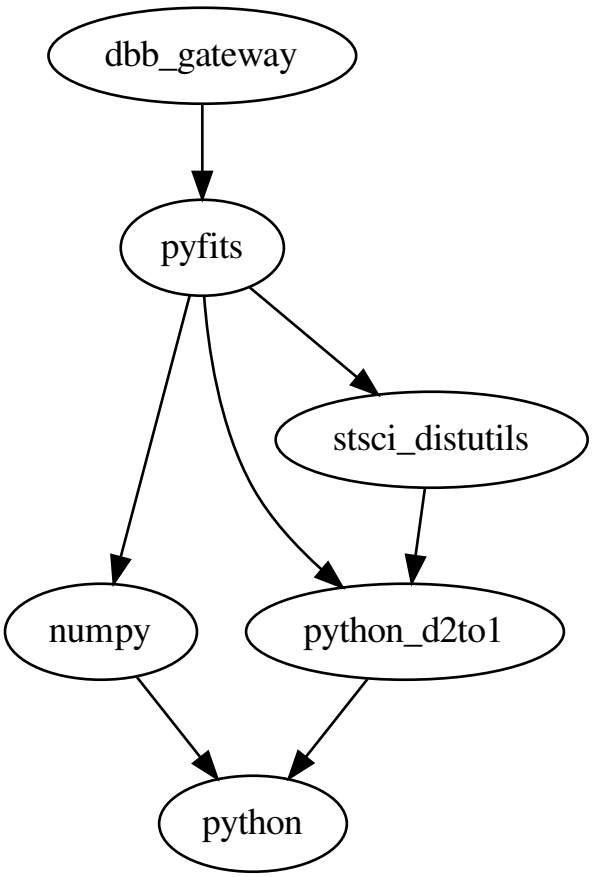
Open it in GitHUb:	https://github.com/lsst-dm/dbb_gateway
Top Level Component:	DBB Ingest/ Metadata Management SW

EUPS dependencies

name	description
pyfits	
numpy	Also included in: **Solar System processing and Forced Photometry,**
python	Also included in: **Solar System processing and Forced Photometry,**
python_d2to1	EUPS package of the PyPI d2to1 Python package
stsci_distutils	EUPS package of the PyPI stsci.distutils Python package

README.md (First 20 lines only)

```
# dbb_gateway
Prototype code that ingests into the Data Backbone raw files delivered by the dbb_gwclient to the
    DBB gateway
```


dbb_gateway
pyfits
stsci_distutils
numpy
python_d2to1
python

4.11 suit

Open it in GitHUb:	https://github.com/lsst/suit
Top Level Component:	LSP Portal Software
GitHub Teams:	Data Management

README.md (First 20 lines only)

```
# SUIT


## Description
The SUIT (Science User Interface and Tools) repository contains applications built on the Firefly
    Toolkit.
It is meant to be used with [Firefly](https://github.com/Caltech-IPAC/firefly).

The principal current application is "suit", otherwise known as the Portal Aspect application,
    which
contains both the Portal search screens and visualization capabilities, and the "slate" endpoint
    that
is used for Python-based image and table visualizations.


## Build Instuctions

- Install [JDK 8](http://www.oracle.com/technetwork/java/javase/downloads/jdk8-downloads
    -2133151.html)

- Install [Gradle 4.x](https://gradle.org/install/)

- Install [Node.js 8.x](https://nodejs.org/en/download/)
```

4.12 jupyterhubutils

Utilities for LSST LSP notebook environment (Hub/spawner side)

Open it in GitHUb:	https://github.com/lsst-sqre/jupyterhubutils
Top Level Component:	LSP Notebook Software

README.md (First 20 lines only)

```
# Utilities for LSST LSP notebook environment (Hub/spawner side)
```

4.13 jupyterlabutils

Utilities for JupyterLab containers in LSST Science Platform environment

Open it in GitHUb:	https://github.com/lsst-sqre/jupyterlabutils
Top Level Component:	LSP Notebook Software

README.md (First 20 lines only)

```
# Utilities for LSST LSP Science Platform notebook aspect (user pod side)
```

4.14 suit-onlinehelp

Open it in GitHUb:	https://github.com/lsst/suit-onlinehelp
Top Level Component:	LSP Portal Online Help

README.md (First 20 lines only)

```
# suit-onlinehelp

Prerequisites
-------------
    - gradle v2.2+
    - clone onlinehelp repository and its dependent repository
        - git clone https://github.com/lsst/suit-onlinehelp
        - git clone https://github.com/Caltech-IPAC/firefly


Build and Install Individually
------------------------------
- cd suit-onlinehelp
- gradle :<project_name>:build      // build only
    - creates an archive of html and supporting files to be install to a webserver
    - the file is placed in ./build/libs/

- gradle :<project_name>:install    // build and install.
    - crates and install online help files
    - HTML_DOC_ROOT environment variable is required to locate the path to the webserver's
      document root.
```

4.15 dax_imgserv

Web Interface for LSST Image Services

Open it in GitHUb:	https://github.com/lsst/dax_imgserv
Top Level Component:	Image/ Cutout Server
GitHub Teams:	Overlords
	Data Management
	Database

README.txt (First 20 lines only)

```
# Useful link:
http://blog.miguelgrinberg.com/post/designing-a-restful-api-with-python-and-flask

# To install flask:
sudo aptitude install python-flask

# To run some quick tests:

  # run the server
  python bin/imageServer.py

  # and fetch the urls:
  http://localhost:5000/api/image/soda/availability
  http://localhost:5000/api/image/soda/capabilities
  http://localhost:5000/api/image/soda/examples
  http://localhost:5000/api/image/soda/sync?ID=DC_W13_Stripe82.calexp.r&POS=CIRCLE
      +37.644598+0.104625+100
  http://localhost:5000/api/image/soda/sync?ID=DC_W13_Stripe82.calexp.r&POS=RANGE
      +37.616820222+37.67235778+0.07684722222+0.132402777
  http://localhost:5000/api/image/soda/sync?ID=DC_W13_Stripe82.calexp.r&POS=POLYGON
      +37.6580803+0.0897081+37.6580803+0.1217858+37.6186104+0.1006648
  http://localhost:5000/api/image/soda/sync?ID=DC_W13_Stripe82.calexp.r&POS=BRECT
      +37.644598+0.104625+100+100+pixel
```

4.16 ap_pipe

LSST Data Management Alert Production Pipeline

Open it in GitHUb:	https://github.com/lsst/ap_pipe
Top Level Component:	Alert Production
GitHub Teams:	Overlords
	Data Management

EUPS dependencies

name	description
utils	Common code, floating-point utilities, and angle stringification for LSST Data Management. Also included in: **Observatory Operations Data Service SW, Calibration Software, Solar System processing and Forced Photometry, Science Pipelines Distribution, Science Pipelines Libraries, Data Butler, Task Framework, Distributed Database,**
base	C++/Python import utilities and doxygen configuration for LSST Data Management. Also included in: **Observatory Operations Data Service SW, Calibration Software, Solar System processing and Forced Photometry, Science Pipelines Distribution, Science Pipelines Libraries, Data Butler, Task Framework, Distributed Database,**
sconsUtils	Build system for LSST Data Management packages with standard layout. Also included in: **Observatory Operations Data Service SW, Calibration Software, Solar System processing and Forced Photometry, Science Pipelines Distribution, Science Pipelines Libraries, Data Butler, Task Framework, Distributed Database,**
pex_exceptions	Exception base classes and common exceptions, including C++-Python exception translation for LSST Data Management. Also included in: **Observatory Operations Data Service SW, Calibration Software, Solar System processing and Forced Photometry, Science Pipelines Distribution, Science Pipelines Libraries, Data Butler, Task Framework, Distributed Database,**
pex_config	Configuration interface and history-tracking for LSST Data Management. Also included in: **Observatory Operations Data Service SW, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries, Task Framework,**
pipe_base	LSST Data Management: base classes for data processing tasks Also included in: **Observatory Operations Data Service SW, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries, Task Framework,**
daf_butler	Prototype for data access framework described in DMTN-056 Also included in: **Observatory Operations Data Service SW, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries, Data Butler, Task Framework,**

sphgeom	C++ spherical geometry primitives for LSST Data Management Also included in: **Observatory Operations Data Service SW, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries, Data Butler, Task Framework, Distributed Database,**
daf_persistence	Data access interface (the Butler) and deprecated persistence framework for LSST Data Management. Also included in: **Observatory Operations Data Service SW, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries, Task Framework,**
log	LSST DM Logging for C++ and Python Also included in: **Observatory Operations Data Service SW, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries, Task Framework, Distributed Database,**
pex_policy	Deprecated configuration interface for LSST Data Management (replaced by pex_config). Also included in: **Observatory Operations Data Service SW, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries, Task Framework,**
daf_base	Low-level data structures, including memory-management helpers (Citizen), mappings (PropertySet, PropertyList), and DateTime. Also included in: **Observatory Operations Data Service SW, Calibration Software, Solar System processing and Forced Photometry, Science Pipelines Distribution, Science Pipelines Libraries, Task Framework,**
afw	LSST data management: pipeline library code and primitives including images and tables Also included in: **Observatory Operations Data Service SW, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries, Task Framework,**
geom	Low-level geometry primitives for LSST Data Management Also included in: **Observatory Operations Data Service SW, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries, Task Framework,**
astshim	C++ shim for a subset of the AST astronomical library Also included in: **Observatory Operations Data Service SW, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries, Task Framework,**
pipe_tasks	LSST Data Management: astronomical data processing tasks Also included in: **Observatory Operations Data Service SW, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries,**
meas_base	LSST Data Management: core astronomical measurement algorithms Also included in: **Observatory Operations Data Service SW, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries,**

coadd_utils	LSST data management: base classes for coadding (stacking) astronomical images Also included in: **Observatory Operations Data Service SW, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries,**
obs_base	Data access utilities and camera-specialization interfaces for LSST Data Management. Also included in: **Observatory Operations Data Service SW, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries,**
astro_metadata_translator	Observation metadata handling infrastructure Also included in: **Observatory Operations Data Service SW, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries,**
meas_algorithms	LSST Data Management: astronomical measurement algorithms Also included in: **Observatory Operations Data Service SW, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries,**
obs_test	Configuration and tasks for a test camera on the LSST Data Management Stack Also included in: **Observatory Operations Data Service SW, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries,**
obs_test_data	Repository to hold user curated data for obs_test Also included in: **Observatory Operations Data Service SW, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries,**
meas_extensions_scarlet	Also included in: **Observatory Operations Data Service SW, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries,**
scarlet	Source separation in multi-band images by Constrained Matrix Factorization Also included in: **Observatory Operations Data Service SW, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries,**
proxmin	Proximal optimization in pure python Also included in: **Observatory Operations Data Service SW, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries,**
scarlet_extensions	Unofficial but useful methods and classes to use with scarlet Also included in: **Observatory Operations Data Service SW, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries,**
kht	Kernel-Based Hough Transform for Detecting Straight Lines in Images Also included in: **Observatory Operations Data Service SW, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries,**
eigen	Also included in: **Observatory Operations Data Service SW, Calibration Software, Solar System processing and Forced Photometry, Science Pipelines Distribution, Science Pipelines Libraries,**

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ap_association	Repository for holding code related to Alert Production difference source association Also included in: **Science Pipelines Distribution, Science Pipelines Libraries,**
alert_packet	Alert schemas in Avro format. Also included in: **Science Pipelines Distribution, Science Pipelines Libraries,**
dax_apdb	Interface and implementation for LSST Prompt Products Database Also included in: **Science Pipelines Distribution, Science Pipelines Libraries,**
verify	lsst.verify - LSST Science Pipelines Verification Framework Also included in: **Science Pipelines Distribution, Science Pipelines Libraries,**
verify_metrics	lsst.verify.metrics — Metric and specification definitions for the LSST Science Pipelines Verification Framework. Also included in: **Science Pipelines Distribution, Science Pipelines Libraries,**

README.md (First 20 lines only)

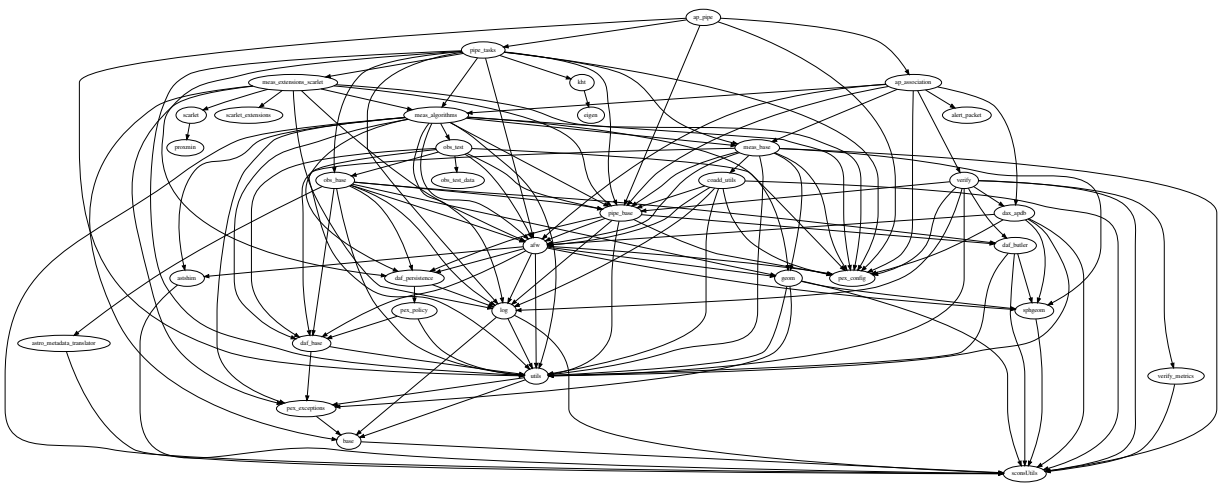
```
# ap_pipe

This package contains the LSST Data Management Alert Production Pipeline.

For up-to-date documentation, including a tutorial, see the 'doc' directory.

ap_pipe processes raw images that have been ingested into a Butler repository
with corresponding calibration products and templates. It produces calexps,
difference images and source catalogs, and an association database.

The user must specify the main repository with ingested images (and the
location of the calibration products and templates if they reside elsewhere),
the name of the association database (may be either created from scratch or
connected to for continued associating), and a Butler data ID.
```



4.17 cp_pipe

Calibration-products production pipeline

Open it in GitHUb:	https://github.com/lsst/cp_pipe
Top Level Component:	Calibration Software
GitHub Teams:	Overlords
	Data Management
	DMLT

EUPS dependencies

name	description
pex_config	Configuration interface and history-tracking for LSST Data Management. Also included in: **Observatory Operations Data Service SW, Alert Production, Science Pipelines Distribution, Science Pipelines Libraries, Task Framework,**
pipe_base	LSST Data Management: base classes for data processing tasks Also included in: **Observatory Operations Data Service SW, Alert Production, Science Pipelines Distribution, Science Pipelines Libraries, Task Framework,**
daf_butler	Prototype for data access framework described in DMTN-056 Also included in: **Observatory Operations Data Service SW, Alert Production, Science Pipelines Distribution, Science Pipelines Libraries, Data Butler, Task Framework,**
sphgeom	C++ spherical geometry primitives for LSST Data Management Also included in: **Observatory Operations Data Service SW, Alert Production, Science Pipelines Distribution, Science Pipelines Libraries, Data Butler, Task Framework, Distributed Database,**
sconsUtils	Build system for LSST Data Management packages with standard layout. Also included in: **Observatory Operations Data Service SW, Alert Production, Solar System processing and Forced Photometry, Science Pipelines Distribution, Science Pipelines Libraries, Data Butler, Task Framework, Distributed Database,**
utils	Common code, floating-point utilities, and angle stringification for LSST Data Management. Also included in: **Observatory Operations Data Service SW, Alert Production, Solar System processing and Forced Photometry, Science Pipelines Distribution, Science Pipelines Libraries, Data Butler, Task Framework, Distributed Database,**
base	C++/Python import utilities and doxygen configuration for LSST Data Management. Also included in: **Observatory Operations Data Service SW, Alert Production, Solar System processing and Forced Photometry, Science Pipelines Distribution, Science Pipelines Libraries, Data Butler, Task Framework, Distributed Database,**

pex_exceptions	Exception base classes and common exceptions, including C++-Python exception translation for LSST Data Management. Also included in: **Observatory Operations Data Service SW, Alert Production, Solar System processing and Forced Photometry, Science Pipelines Distribution, Science Pipelines Libraries, Data Butler, Task Framework, Distributed Database,**
daf_persistence	Data access interface (the Butler) and deprecated persistence framework for LSST Data Management. Also included in: **Observatory Operations Data Service SW, Alert Production, Science Pipelines Distribution, Science Pipelines Libraries, Task Framework,**
log	LSST DM Logging for C++ and Python Also included in: **Observatory Operations Data Service SW, Alert Production, Science Pipelines Distribution, Science Pipelines Libraries, Task Framework, Distributed Database,**
pex_policy	Deprecated configuration interface for LSST Data Management (replaced by pex_config). Also included in: **Observatory Operations Data Service SW, Alert Production, Science Pipelines Distribution, Science Pipelines Libraries, Task Framework,**
daf_base	Low-level data structures, including memory-management helpers (Citizen), mappings (PropertySet, PropertyList), and DateTime. Also included in: **Observatory Operations Data Service SW, Alert Production, Solar System processing and Forced Photometry, Science Pipelines Distribution, Science Pipelines Libraries, Task Framework,**
afw	LSST data management: pipeline library code and primitives including images and tables Also included in: **Observatory Operations Data Service SW, Alert Production, Science Pipelines Distribution, Science Pipelines Libraries, Task Framework,**
geom	Low-level geometry primitives for LSST Data Management Also included in: **Observatory Operations Data Service SW, Alert Production, Science Pipelines Distribution, Science Pipelines Libraries, Task Framework,**
astshim	C++ shim for a subset of the AST astronomical library Also included in: **Observatory Operations Data Service SW, Alert Production, Science Pipelines Distribution, Science Pipelines Libraries, Task Framework,**
ip_isr	LSST data management: instrument signature removal (detrending) for astronomical images Also included in: **Observatory Operations Data Service SW, Science Pipelines Distribution,**
meas_algorithms	LSST Data Management: astronomical measurement algorithms Also included in: **Observatory Operations Data Service SW, Alert Production, Science Pipelines Distribution, Science Pipelines Libraries,**

meas_base	LSST Data Management: core astronomical measurement algorithms Also included in: **Observatory Operations Data Service SW, Alert Production, Science Pipelines Distribution, Science Pipelines Libraries,**
coadd_utils	LSST data management: base classes for coadding (stacking) astronomical images Also included in: **Observatory Operations Data Service SW, Alert Production, Science Pipelines Distribution, Science Pipelines Libraries,**
obs_test	Configuration and tasks for a test camera on the LSST Data Management Stack Also included in: **Observatory Operations Data Service SW, Alert Production, Science Pipelines Distribution, Science Pipelines Libraries,**
obs_base	Data access utilities and camera-specialization interfaces for LSST Data Management. Also included in: **Observatory Operations Data Service SW, Alert Production, Science Pipelines Distribution, Science Pipelines Libraries,**
astro_metadata_translator	Observation metadata handling infrastructure Also included in: **Observatory Operations Data Service SW, Alert Production, Science Pipelines Distribution, Science Pipelines Libraries,**
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pipe_drivers	LSST Data Management: high level task coordination scripts Also included in: **Science Pipelines Distribution,**
ctrl_pool	Framework for parallelized "supertasks" using MPI, ported from the HSC pipeline Also included in: **Science Pipelines Distribution,**
pipe_tasks	LSST Data Management: astronomical data processing tasks Also included in: **Observatory Operations Data Service SW, Alert Production, Science Pipelines Distribution, Science Pipelines Libraries,**
meas_extensions_scarlet	Also included in: **Observatory Operations Data Service SW, Alert Production, Science Pipelines Distribution, Science Pipelines Libraries,**
scarlet	Source separation in multi-band images by Constrained Matrix Factorization Also included in: **Observatory Operations Data Service SW, Alert Production, Science Pipelines Distribution, Science Pipelines Libraries,**
proxmin	Proximal optimization in pure python Also included in: **Observatory Operations Data Service SW, Alert Production, Science Pipelines Distribution, Science Pipelines Libraries,**
scarlet_extensions	Unofficial but useful methods and classes to use with scarlet Also included in: **Observatory Operations Data Service SW, Alert Production, Science Pipelines Distribution, Science Pipelines Libraries,**

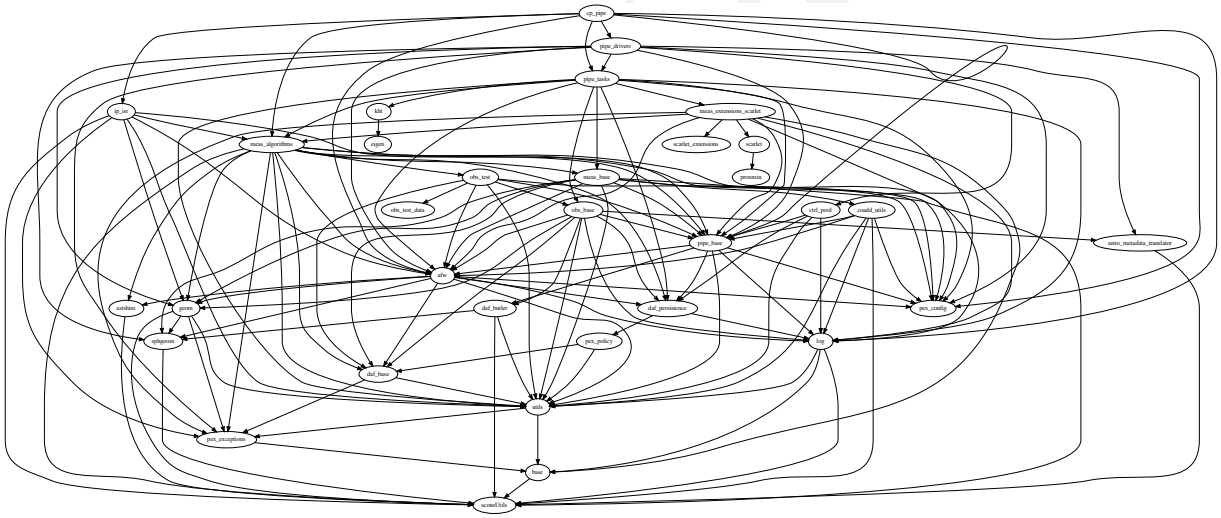
Rubin Observatory

kht	Kernel-Based Hough Transform for Detecting Straight Lines in Images Also included in: **Observatory Operations Data Service SW, Alert Production, Science Pipelines Distribution, Science Pipelines Libraries,**
eigen	Also included in: **Observatory Operations Data Service SW, Alert Production, Solar System processing and Forced Photometry, Science Pipelines Distribution, Science Pipelines Libraries,**

README.rst (First 20 lines only)

```
########################################
Calibration Products Production Package
########################################

Code to produce calibration products, required to perform ISR and other calibration tasks.
```



4.18 mops_daymops

Open it in GitHUb:	https://github.com/lsst/mops_daymops
Top Level Component:	Solar System processing and Forced Photometry
GitHub Teams:	Overlords Data Management

EUPS dependencies

name	description
scons	
python	Also included in: **DBB Ingest/ Metadata Management SW,**
swig	
gsl	
daf_base	Low-level data structures, including memory-management helpers (Citizen), mappings (PropertySet, PropertyList), and DateTime. Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries, Task Framework,**
utils	Common code, floating-point utilities, and angle stringification for LSST Data Management. Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries, Data Butler, Task Framework, Distributed Database,**
base	C++/Python import utilities and doxygen configuration for LSST Data Management. Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries, Data Butler, Task Framework, Distributed Database,**
sconsUtils	Build system for LSST Data Management packages with standard layout. Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries, Data Butler, Task Framework, Distributed Database,**
pex_exceptions	Exception base classes and common exceptions, including C++-Python exception translation for LSST Data Management. Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries, Data Butler, Task Framework, Distributed Database,**

eigen	Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries,**
mysqlpython	
mariadbclient	Client for connecting to MariaDB database server
numpy	Also included in: **DBB Ingest/ Metadata Management SW,**

README.quickstart.txt (First 20 lines only)

```
Here's a greatly simplified guide to running MOPS at the moment, which
will run findTracklets, collapseTracklets linkTracklets for you.

I was using Bash when I came up with these, you may need to change a
few things if you're using *csh.

# set up your environment
setlsst
setup mysqlpython
setup mops_daymops
export MOPS_HACKS=$MOPS_DAYMOPS_DIR/tests/experimentScripts/

# get data
mkdir myMopsRun
cd myMopsRun
wget --user=USER --password=PASSWORD dias_pt1_nodeep.short.astromErr


# populate the DB for later. I assume you have the OpSim DB already.
echo "CREATE DATABASE myMops; USE myMops; 'cat fullerDiaSource.sql';" | mysql
```

README.txt (First 20 lines only)

```
Jmyers Oct 22

Updated thoroughly to describe how I'm currently doing things.

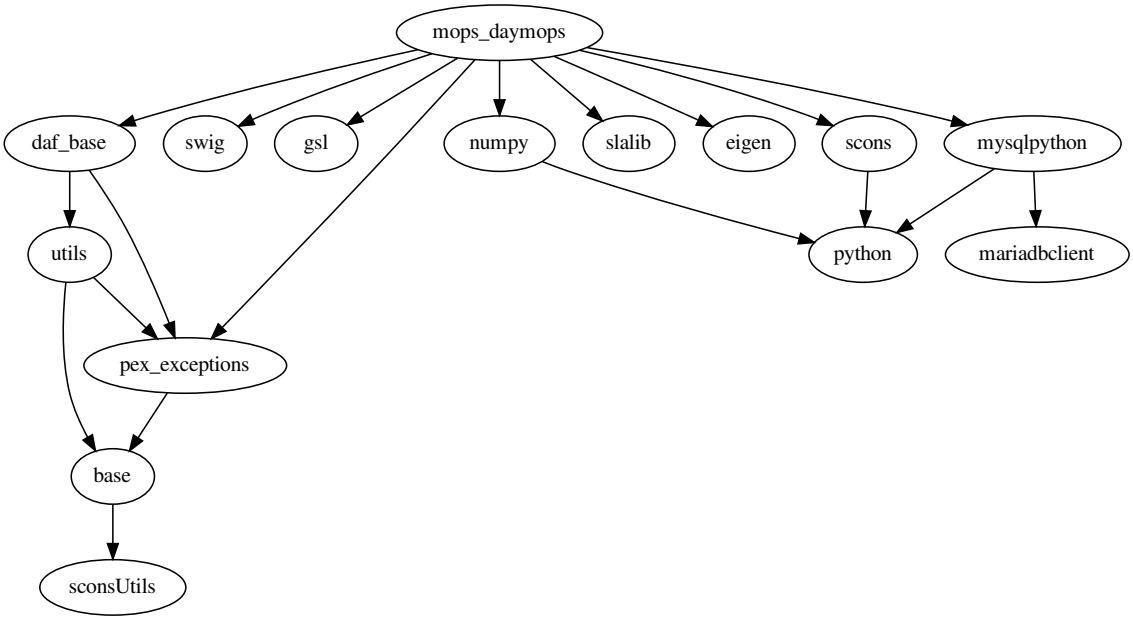
The following is a set of instructions for running
find/collapse/linkTracklets on some diaSources.

In the future these scripts (or more likely, better versions of
all of this) will be modified so that pipelines can run each
stage of find/collapse/linkTracklets on particular sets of data.

All the scripts should be in the same directory as this readme file.
```

INSTALLING/BUILDING C++ FIND/LINKTRACKLETS (etc.)

Build the C++ tools using instructions online at http://dev.lsstcorp.org/trac/wiki/MOPS/Installing_MOPS



4.19 lsst_distrib

Open it in GitHUb:	https://github.com/lsst/lsst_distrib
Top Level Component:	Science Pipelines Distribution
GitHub Teams:	Overlords
	Data Management

EUPS dependencies

name	description
lsst_apps	Also included in: **Science Pipelines Libraries,**
meas_deblender	LSST Data Management: astronomical source deblender Also included in: **Science Pipelines Libraries,**
afw	LSST data management: pipeline library code and primitives including images and tables Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Science Pipelines Libraries, Task Framework,**
daf_base	Low-level data structures, including memory-management helpers (Citizen), mappings (PropertySet, PropertyList), and DateTime. Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Solar System processing and Forced Photometry, Science Pipelines Libraries, Task Framework,**
utils	Common code, floating-point utilities, and angle stringification for LSST Data Management. Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Solar System processing and Forced Photometry, Science Pipelines Libraries, Data Butler, Task Framework, Distributed Database,**
base	C++/Python import utilities and doxygen configuration for LSST Data Management. Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Solar System processing and Forced Photometry, Science Pipelines Libraries, Data Butler, Task Framework, Distributed Database,**
sconsUtils	Build system for LSST Data Management packages with standard layout. Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Solar System processing and Forced Photometry, Science Pipelines Libraries, Data Butler, Task Framework, Distributed Database,**
pex_exceptions	Exception base classes and common exceptions, including C++-Python exception translation for LSST Data Management. Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Solar System processing and Forced Photometry, Science Pipelines Libraries, Data Butler, Task Framework, Distributed Database,**

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log	LSST DM Logging for C++ and Python Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Science Pipelines Libraries, Task Framework, Distributed Database,**
pex_policy	Deprecated configuration interface for LSST Data Management (replaced by pex_config). Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Science Pipelines Libraries, Task Framework,**
pex_config	Configuration interface and history-tracking for LSST Data Management. Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Science Pipelines Libraries, Task Framework,**
geom	Low-level geometry primitives for LSST Data Management Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Science Pipelines Libraries, Task Framework,**
sphgeom	C++ spherical geometry primitives for LSST Data Management Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Science Pipelines Libraries, Data Butler, Task Framework, Distributed Database,**
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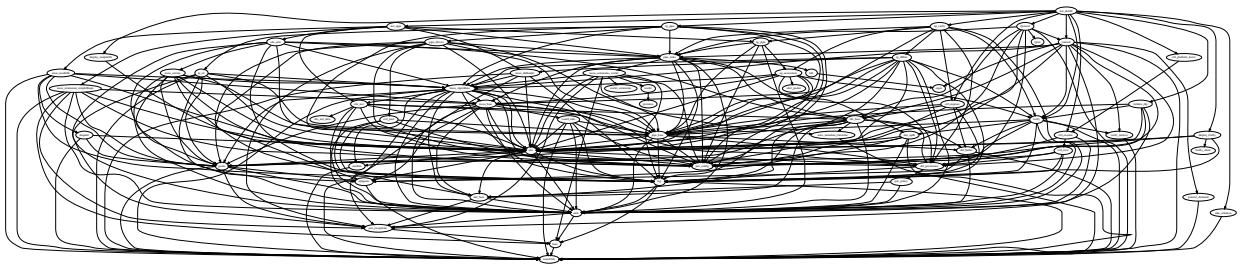
meas_base	LSST Data Management: core astronomical measurement algorithms Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Science Pipelines Libraries,**
coadd_utils	LSST data management: base classes for coadding (stacking) astronomical images Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Science Pipelines Libraries,**
pipe_base	LSST Data Management: base classes for data processing tasks Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Science Pipelines Libraries, Task Framework,**

daf_butler	Prototype for data access framework described in DMTN-056 Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Science Pipelines Libraries, Data Butler, Task Framework,**
obs_test	Configuration and tasks for a test camera on the LSST Data Management Stack Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Science Pipelines Libraries,**
obs_base	Data access utilities and camera-specialization interfaces for LSST Data Management. Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Science Pipelines Libraries,**
astro_metadata_translator	Observation metadata handling infrastructure Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Science Pipelines Libraries,**
obs_test_data	Repository to hold user curated data for obs_test Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Science Pipelines Libraries,**
meas_modelfit	LSST Data Management: model fitting algorithms Also included in: **Science Pipelines Libraries,**
shapelet	Gauss-Hermite and Gauss-Laguerre functions for use with the LSST Data Management pipeline. Also included in: **Science Pipelines Libraries,**
pipe_tasks	LSST Data Management: astronomical data processing tasks Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Science Pipelines Libraries,**
meas_extensions_scarlet	Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Science Pipelines Libraries,**
scarlet	Source separation in multi-band images by Constrained Matrix Factorization Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Science Pipelines Libraries,**
proxmin	Proximal optimization in pure python Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Science Pipelines Libraries,**
scarlet_extensions	Unofficial but useful methods and classes to use with scarlet Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Science Pipelines Libraries,**
kht	Kernel-Based Hough Transform for Detecting Straight Lines in Images Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Science Pipelines Libraries,**

eigen	Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Solar System processing and Forced Photometry, Science Pipelines Libraries,**
ap_pipe	LSST Data Management Alert Production Pipeline Also included in: **Alert Production, Science Pipelines Libraries,**
ap_association	Repository for holding code related to Alert Production difference source association Also included in: **Alert Production, Science Pipelines Libraries,**
alert_packet	Alert schemas in Avro format. Also included in: **Alert Production, Science Pipelines Libraries,**
dax_apdb	Interface and implementation for LSST Prompt Products Database Also included in: **Alert Production, Science Pipelines Libraries,**
verify	lsst.verify - LSST Science Pipelines Verification Framework Also included in: **Alert Production, Science Pipelines Libraries,**
verify_metrics	lsst.verify.metrics — Metric and specification definitions for the LSST Science Pipelines Verification Framework. Also included in: **Alert Production, Science Pipelines Libraries,**
obs_sdss	SDSS-specific configuration and tasks for the LSST Data Management Stack Also included in: **Science Pipelines Libraries,**
meas_astrom	LSST Data Management: astrometric measurement algorithms Also included in: **Science Pipelines Libraries,**
meas_extensions_simpleShape	LSST Data Management: Measure second moments with a pre-defined circular Gaussian weighting Also included in: **Science Pipelines Libraries,**
ctrl_execute	LSST Data Management orchestration execution wrapper
ctrl_orca	LSST Data Management orchestration
ctrl_mpexec	Execution framework for PipelineTask
ctrl_platform_lsstvc	Verification cluster configuration and execution files
jointcal	Simultaneous astrometry and photometry
jointcal_cholmod	Minimal dependency-free subset of SuiteSparse for Cholesky factorization
ap_verify	Verification test framework for DM Alert Production

ip_diffim	LSST data management: astronomical image differencing
display_firefly	Interface between afw and firefly
firefly_client	Python API for Firefly
display_matplotlib	afwDisplay using matplotlib as a backend
cp_pipe	Calibration-products production pipeline Also included in: **Calibration Software,**
ip_isr	LSST data management: instrument signature removal (detrending) for astronomical images Also included in: **Observatory Operations Data Service SW, Calibration Software,**
pipe_drivers	LSST Data Management: high level task coordination scripts Also included in: **Calibration Software,**
ctrl_pool	Framework for parallelized "supertasks" using MPI, ported from the HSC pipeline Also included in: **Calibration Software,**
sdm_schemas	
validate_drp	Validate an output data repository against LSST Science Requirements Document Key Performance Metrics.
fgcmcal	Global Photometric Calibration in LSST with FGCM
fgcm	Python implementation of the Forward Global Calibration Method



4.20 lsst_apps

Open it in GitHUb:	https://github.com/lsst/lsst_apps
Top Level Component:	Science Pipelines Libraries
GitHub Teams:	Overlords
	Data Management

EUPS dependencies

name	description
meas_deblender	LSST Data Management: astronomical source deblender Also included in: **Science Pipelines Distribution,**
afw	LSST data management: pipeline library code and primitives including images and tables Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Science Pipelines Distribution, Task Framework,**
daf_base	Low-level data structures, including memory-management helpers (Citizen), mappings (PropertySet, PropertyList), and DateTime. Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Solar System processing and Forced Photometry, Science Pipelines Distribution, Task Framework,**
utils	Common code, floating-point utilities, and angle stringification for LSST Data Management. Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Solar System processing and Forced Photometry, Science Pipelines Distribution, Data Butler, Task Framework, Distributed Database,**
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daf_butler	Prototype for data access framework described in DMTN-056 Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Science Pipelines Distribution, Data Butler, Task Framework,**
obs_test	Configuration and tasks for a test camera on the LSST Data Management Stack Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Science Pipelines Distribution,**
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obs_test_data	Repository to hold user curated data for obs_test Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Science Pipelines Distribution,**
meas_modelfit	LSST Data Management: model fitting algorithms Also included in: **Science Pipelines Distribution,**
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kht	Kernel-Based Hough Transform for Detecting Straight Lines in Images Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Science Pipelines Distribution,**

eigen	Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Solar System processing and Forced Photometry, Science Pipelines Distribution,**
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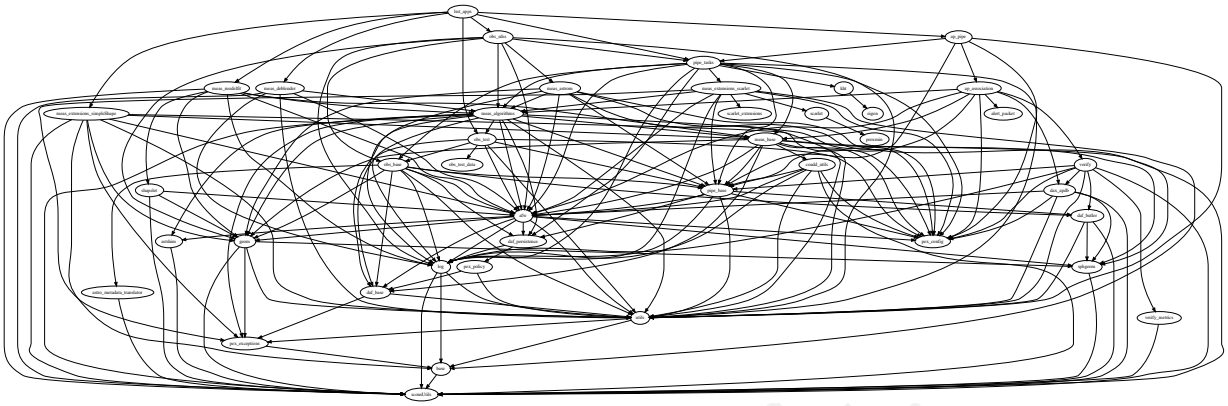
ap_association	Repository for holding code related to Alert Production difference source association Also included in: **Alert Production, Science Pipelines Distribution,**
alert_packet	Alert schemas in Avro format. Also included in: **Alert Production, Science Pipelines Distribution,**
dax_apdb	Interface and implementation for LSST Prompt Products Database Also included in: **Alert Production, Science Pipelines Distribution,**
verify	lsst.verify - LSST Science Pipelines Verification Framework Also included in: **Alert Production, Science Pipelines Distribution,**
verify_metrics	lsst.verify.metrics — Metric and specification definitions for the LSST Science Pipelines Verification Framework. Also included in: **Alert Production, Science Pipelines Distribution,**
obs_sdss	SDSS-specific configuration and tasks for the LSST Data Management Stack Also included in: **Science Pipelines Distribution,**
meas_astrom	LSST Data Management: astrometric measurement algorithms Also included in: **Science Pipelines Distribution,**
meas_extensions_simpleShape	LSST Data Management: Measure second moments with a pre-defined circular Gaussian weighting Also included in: **Science Pipelines Distribution,**

README.md (First 20 lines only)

```
# lsst_apps

This is a metapackage providing a minimalist set of [LSST Science Pipelines](https://pipelines.
    lsst.io) packages. This is a subset of the full [lsst_distrib](https://github.com/lsst/
    lsst_distrib) package. This dependency list is tracked via [eups](https://github.com/
    RobertLuptonTheGood/eups) in the 'ups/lsst_apps.table' file.
```

Rubin Observatory



4.21 daf_butler

Prototype for data access framework described in DMTN-056

Open it in GitHUb:	https://github.com/lsst/daf_butler
Top Level Component:	Data Butler
GitHub Teams:	Overlords
	Data Management
	Database

EUPS dependencies

name	description
sphgeom	C++ spherical geometry primitives for LSST Data Management Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries, Task Framework, Distributed Database,**
sconsUtils	Build system for LSST Data Management packages with standard layout. Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Solar System processing and Forced Photometry, Science Pipelines Distribution, Science Pipelines Libraries, Task Framework, Distributed Database,**
utils	Common code, floating-point utilities, and angle stringification for LSST Data Management. Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Solar System processing and Forced Photometry, Science Pipelines Distribution, Science Pipelines Libraries, Task Framework, Distributed Database,**
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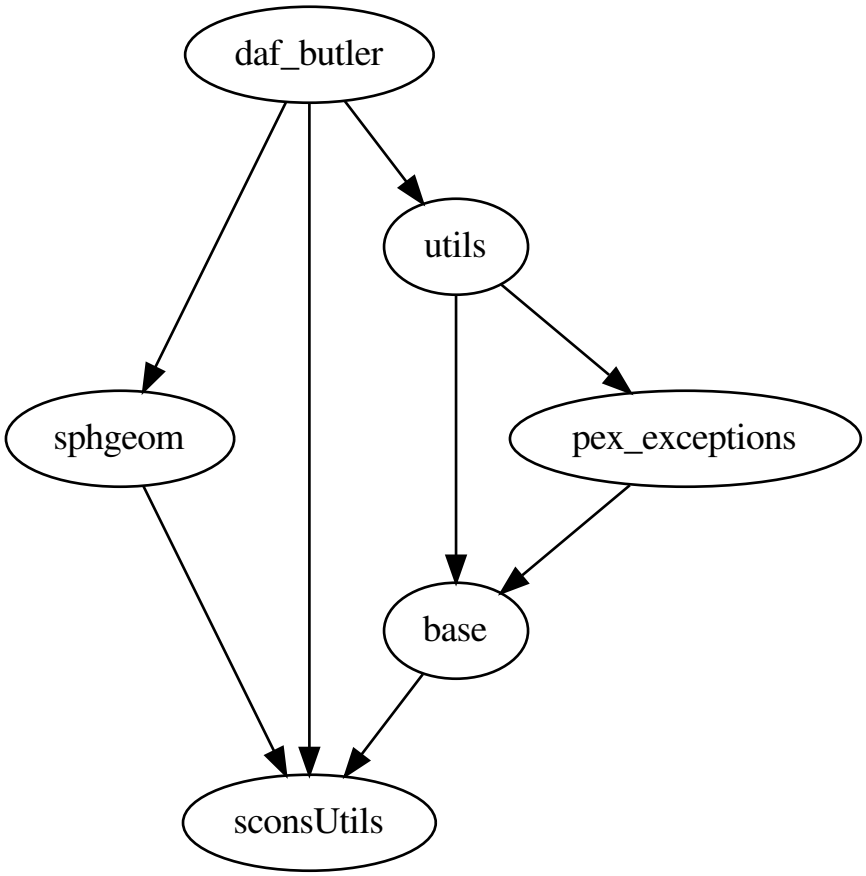
pex_exceptions	Exception base classes and common exceptions, including C++-Python exception translation for LSST Data Management. Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Solar System processing and Forced Photometry, Science Pipelines Distribution, Science Pipelines Libraries, Task Framework, Distributed Database,**

README.md (First 20 lines only)

```
# daf_butler

LSST Data Access framework described in [DMTN-056](https://dmtn-056.lsst.io).
```

This is a **Python 3 only** package (we assume Python 3.6 or higher).



4.22 pipe_supertask

Super Task implementation

Open it in GitHUb:	https://github.com/lsst/pipe_supertask
Top Level Component:	Task Framework

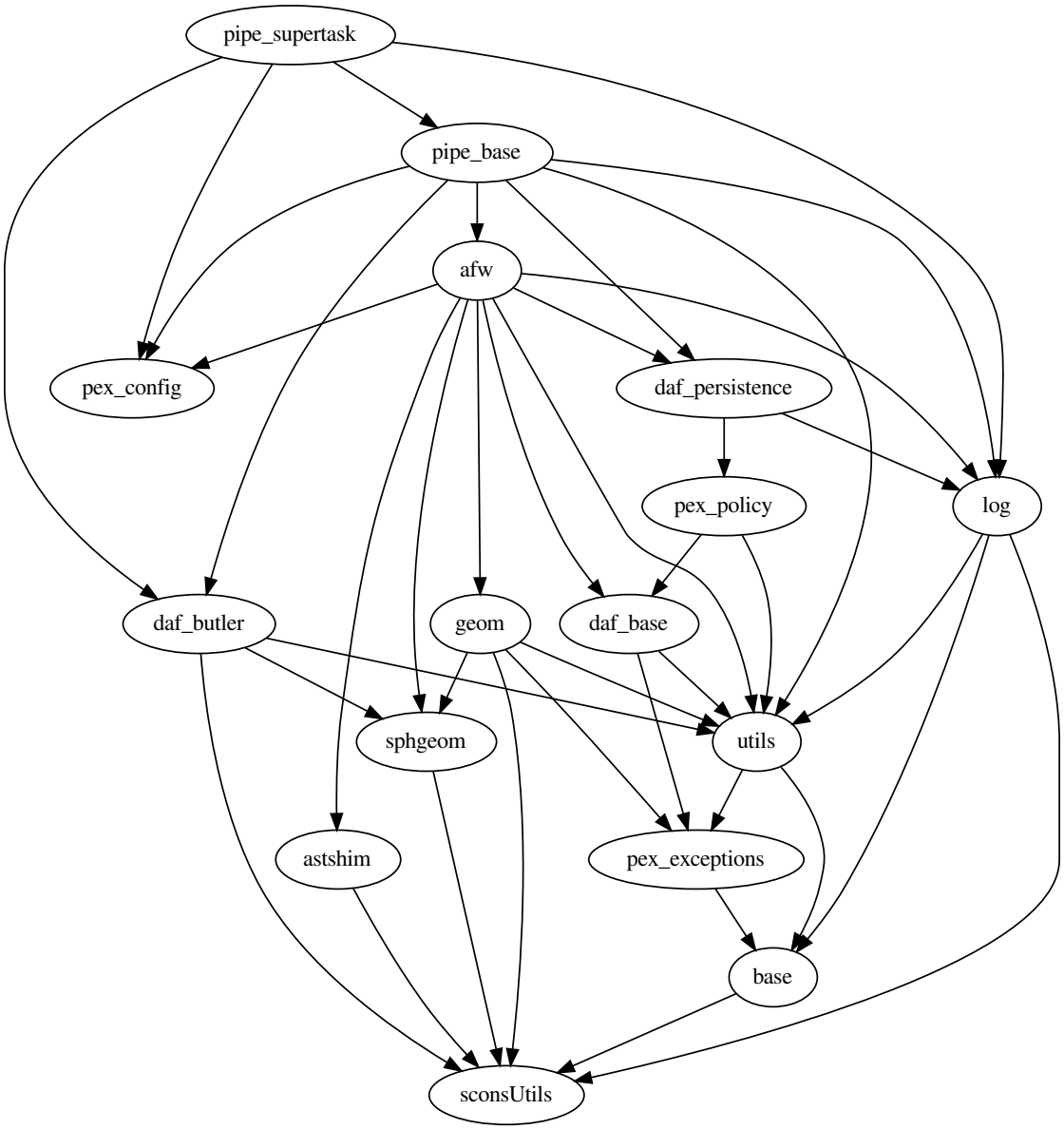
EUPS dependencies

name	description
daf_butler	Prototype for data access framework described in DMTN-056 Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries, Data Butler,**
sphgeom	C++ spherical geometry primitives for LSST Data Management Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries, Data Butler, Distributed Database,**
sconsUtils	Build system for LSST Data Management packages with standard layout. Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Solar System processing and Forced Photometry, Science Pipelines Distribution, Science Pipelines Libraries, Data Butler, Distributed Database,**
utils	Common code, floating-point utilities, and angle stringification for LSST Data Management. Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Solar System processing and Forced Photometry, Science Pipelines Distribution, Science Pipelines Libraries, Data Butler, Distributed Database,**
base	C++/Python import utilities and doxygen configuration for LSST Data Management. Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Solar System processing and Forced Photometry, Science Pipelines Distribution, Science Pipelines Libraries, Data Butler, Distributed Database,**
pex_exceptions	Exception base classes and common exceptions, including C++-Python exception translation for LSST Data Management. Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Solar System processing and Forced Photometry, Science Pipelines Distribution, Science Pipelines Libraries, Data Butler, Distributed Database,**
log	LSST DM Logging for C++ and Python Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries, Distributed Database,**

pex_config	Configuration interface and history-tracking for LSST Data Management. Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries,**
pipe_base	LSST Data Management: base classes for data processing tasks Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries,**
daf_persistence	Data access interface (the Butler) and deprecated persistence framework for LSST Data Management. Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries,**
pex_policy	Deprecated configuration interface for LSST Data Management (replaced by pex_config). Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries,**
daf_base	Low-level data structures, including memory-management helpers (Citizen), mappings (PropertySet, PropertyList), and DateTime. Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Solar System processing and Forced Photometry, Science Pipelines Distribution, Science Pipelines Libraries,**
afw	LSST data management: pipeline library code and primitives including images and tables Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries,**
geom	Low-level geometry primitives for LSST Data Management Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries,**
astshim	C++ shim for a subset of the AST astronomical library Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries,**

README.md (First 20 lines only)

```
# pipe_supertask
Super Task implementation
```


pipe_supertask
pipe_base
afw
pex_config
daf_persistence
log
pex_policy
daf_butler
geom
daf_base
sphgeom
utils
astshim
pex_exceptions
base
sconsUtils

4.23 qserv

LSST Query Services

Open it in GitHUb:	https://github.com/lsst/qserv
Top Level Component:	Distributed Database
GitHub Teams:	Overlords
	Data Management

EUPS dependencies

name	description
antlr4	antlr4 third party package for lsst
db	Lightweight database interface wrappers and abstraction layer for LSST Data Management code, currently limited to MySQL.
log	LSST DM Logging for C++ and Python Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries, Task Framework,**
base	C++/Python import utilities and doxygen configuration for LSST Data Management. Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Solar System processing and Forced Photometry, Science Pipelines Distribution, Science Pipelines Libraries, Data Butler, Task Framework,**
sconsUtils	Build system for LSST Data Management packages with standard layout. Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Solar System processing and Forced Photometry, Science Pipelines Distribution, Science Pipelines Libraries, Data Butler, Task Framework,**
utils	Common code, floating-point utilities, and angle stringification for LSST Data Management. Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Solar System processing and Forced Photometry, Science Pipelines Distribution, Science Pipelines Libraries, Data Butler, Task Framework,**
pex_exceptions	Exception base classes and common exceptions, including C++-Python exception translation for LSST Data Management. Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Solar System processing and Forced Photometry, Science Pipelines Distribution, Science Pipelines Libraries, Data Butler, Task Framework,**
lua	

mariadb	
mysqlproxy	
partition	Spatial Data Partitioning for LSST Qserv
sphgeom	C++ spherical geometry primitives for LSST Data Management Also included in: **Observatory Operations Data Service SW, Alert Production, Calibration Software, Science Pipelines Distribution, Science Pipelines Libraries, Data Butler, Task Framework,**
redis_plus_plus	redis-plus-plus third party package for Vera Rubin Observatory
hiredis	hiredis third-party package for Vera Rubin Observatory
scisql	
xrootd	The XRootD central repository

README.md (First 20 lines only)

```
# Qserv: petascale distributed database

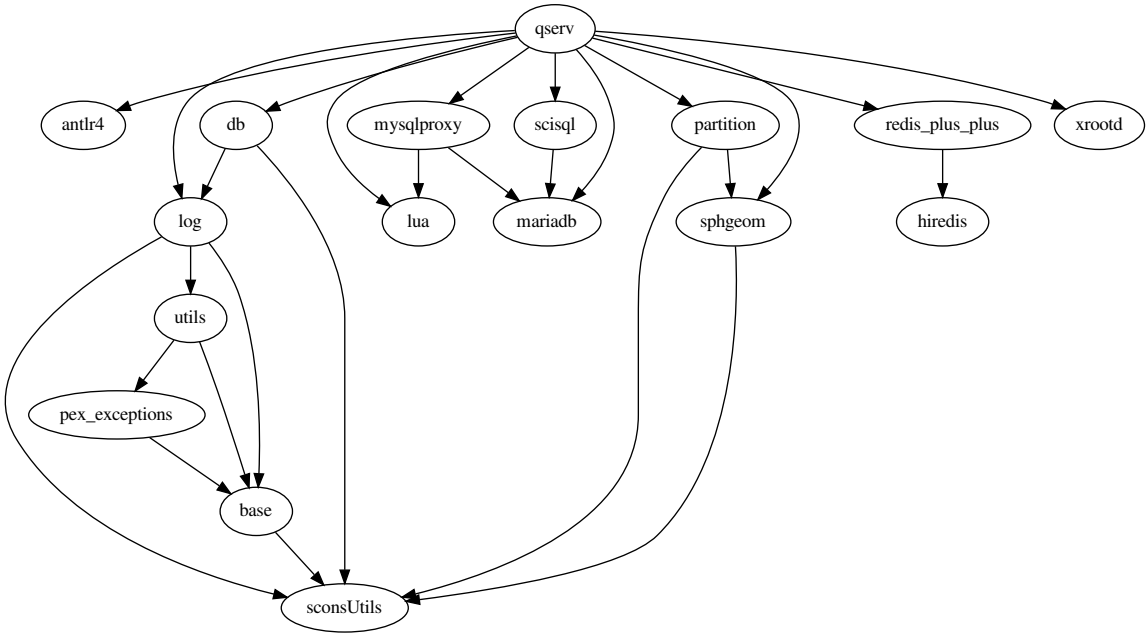
## Master branch status

Continuous integration server launches Qserv build and also multi-node integration tests:

[![Build Status](https://travis-ci.org/lsst/qserv.svg?branch=master)](https://travis-ci.org/lsst/
    qserv)

## Documentation

[Documentation for master branch](https://qserv.lsst.io/)
```


qserv
antlr4
db
mysqlproxy
scisql
partition
redis_plus_plus
xrootd
log
lua
mariadb
sphgeom
hiredis
utils
pex_exceptions
base
sconsUtils

4.24 albuquery

DAX Query Services in Kotlin

Open it in GitHUb:	https://github.com/lsst/albuquery
Top Level Component:	ADQL Translator

README.rst (First 20 lines only)

```
#########
albuquery
#########

''albuquery'' will implement a TAP database query service for the Web APIs Aspect of the LSST
    Science Platform (a.k.a. Data Access Services/DAX).
```

4.25 scipipe_conda_env

Conda environment for LSST Science Pipelines

Open it in GitHUb:	https://github.com/lsst/scipipe_conda_env
Top Level Component:	SciencePipelines Conda Env.
GitHub Teams:	Data Management
	DM Auxilliaries

README.md (First 20 lines only)

```
# Conda Environment for Science Pipelines

This repository contains the definition of the Conda environment used by the LSST Science
    Pipelines.


## Contents

There are two core types of files in the 'etc' directory.

- 'bleed' files, in the pattern of 'conda3_bleed-<platform>-64.yml', indicating the names of
    packages on which the
  Science Pipelines directly depend, or
- 'lock' files, in the pattern of 'conda-<platform>-64.lock', indicating a specific versioned set
     of those packages,
  and packages upon which they depend, which can be directly instantiated as a conda environment;

Where '<platform>' is one of:

- 'linux', indicating that this file has been tested on CentOS (our reference platform), and, by
    extension, is appropriate for use on a Linux systems;
- 'osx', indicating that this file has been tested on macOS.

### Lock files
```

4.26 lsst_build

Open it in GitHUb:	https://github.com/lsst/lsst_build
Top Level Component:	lsst_build
GitHub Teams:	Overlords
	Data Management
	DM Auxilliaries

README.md (First 20 lines only)

```
lsst-build, a builder and continuous integration tool for LSST
==============================================================

[![Build Status](https://travis-ci.org/lsst/lsst_build.svg?branch=master)](https://travis-ci.org/
    lsst/lsst_build)

Provides the following capabilities:

* Given one or more top-level packages, intelligently clone their git
  repositories and check out the requested branches into a build directory:

  ```bash
  lsst-build prepare
     [--repository-pattern=format_pattern_for_repo_URLs]
     [--exclusion-map=exclusions.txt]
     [--version-git-repo=versiondbdir]
     [--ref=branch1 [--ref=branch2 [...]]]
     <builddir> <product1> [product2 [product3 [...]]]
  ```

  Run 'lsst-build prepare -h' to see the full list of options.
```

Rubin Observatory

4.27 jenkins-dm-jobs

Jenkins jobs and pipeline scripts for LSST DM

Open it in GitHUb:	https://github.com/lsst-dm/jenkins-dm-jobs
Top Level Component:	jenkins scripting

README.md (First 20 lines only)

```
jenkins-dm-jobs
===

[![Build Status](https://travis-ci.org/lsst-dm/jenkins-dm-jobs.png)](https://travis-ci.org/lsst-
    dm/jenkins-dm-jobs)
```

4.28 sqre-codekit

LSST DM SQuaRE misc. code management tools

Open it in GitHUb:	https://github.com/lsst-sqre/sqre-codekit
Top Level Component:	codekit

README.md (First 20 lines only)

```
[![Build Status](https://travis-ci.org/lsst-sqre/sqre-codekit.svg?branch=master)](https://travis-
    ci.org/lsst-sqre/sqre-codekit)

# sqre-codekit

LSST DM SQuaRE misc. code management tools

## Installation

sqre-codekit runs on Python 3.6 or newer. You can install it with

'''bash
pip install sqre-codekit
'''

## Available commands

- 'github-auth': Generate a GitHub authentication token.
- 'github-decimate-org': Delete repos and/or teams from a GitHub organization.
- 'github-fork-org': Fork repositories from one GitHub organization to another.
- 'github-get-ratelimit': Display the current github ReST API request ratelimit.
```

Rubin Observatory

4.29 lsstsw

loadLSST

Open it in GitHUb:	https://github.com/lsst/lsstsw
Top Level Component:	lsstsw
GitHub Teams:	Overlords
	Data Management

README.md (First 20 lines only)

```
LSST Distribution Server Account
================================

[![Build Status](https://travis-ci.org/lsst/lsstsw.png)](https://travis-ci.org/lsst/lsstsw)

**‘repos.yaml‘ has been migrated to [‘lsst/repos‘](https://github.com/lsst/repos).**

For a guide to using ‘lsstsw‘, see:

http://developer.lsst.io/en/latest/build-ci/lsstsw.html

*Note: this directory is git managed.*

Structure
---------

| path       | description                                                  |
| :----------|:-------------------------------------------------------------|
| miniconda  | Anaconda Python distribution                                 |
| bin        | software distribution binaries (rebuild, publish)            |
```

5 Non DM Products

This section will list non DM productsi provided by other Rubin/LSST subsystems, that are relevant in order to fulfill DMS requirements.

6 External Products

Manager	Owner	WBS	Team

Short name: **Externals** - Product key: **EXT**

In these area of the product tree are listed those components non provided by LSST/Rubin but relevant for DM.

The products are organized in the following sections:

- resource products (hardware, COTS and external provided softwares)
- data products (reference data for development and operations)

6.1 Hardware and COTS Products

Manager	Owner	WBS	Team

Short name: **Resources** - Product key: **HWCOTS**

External resources needed to implement the DM services:

- Hardware (computing hardware, network hardware, etc)
- COTS
- External software (not developed in DM)

6.1.1 Hardware

Manager	Owner	WBS	Team
	Short name: **DM Hardware** - Product key: **DMHW**		

This section of the product tree shall list the hardware components used by DM.

Considering the actual cloud oriented approach in terms of infrastructure, this section is kept here for reference, and will be used only in case a specific hardware component will show up in the future. Since subsections are empty, there is no need to be reviewed by any manager or owner until specific components are listed in them.

No requirements are traced here.

Products included in this section:

- Compute Nodes - HWCOMP
- Storage Nodes - HWSTOR
- Network Nodes - HWNET

Compute Nodes		(product in: DM Hardware)	
Manager	**Owner**	**WBS**	**Team**

Short name: **Compute Nodes** - Product key: **HWCOMP**

Computational elements. Details will be added here on a per need base.

Uses:	**Used in:**

Storage Nodes (product in: DM Hardware)

Manager	Owner	WBS	Team

Short name: **Storage Nodes** - Product key: **HWSTOR**

Storage components to host data. Details will be added here on a per need base.

Uses:	Used in:

Rubin Observatory

Network Nodes		(product in: DM Hardware)	
Manager	**Owner**	**WBS**	**Team**
Jeff Kantor			
	Short name: **Network Nodes** - Product key: **HWNET**		

The network components required in order to implement local and long distance networks. Details will be added here on a per need base.

Uses:	**Used in:**

6.1.2 COTS

Manager	Owner	WBS	Team

Short name: **COTS SW** - Product key: **COTS**

This section includes all COTS used to implement the DM services.
These are not DM s directly, but are listed here for reference. In many cases, no owner nor manager is specified.

Products included in this section:

- CILogon - CILOGON
- Docker - DOCKER
- Firefly - FIREFLY
- General Parallel File System - GPFS
- Grafana - GRAFANA
- HTCondor - HTCONDOR
- Jupyterhub - JH3
- Jupyterlab - JL3
- JIRA - JRA
- Kubernetes - K8S
- PostgreSQL - PSQL
- Python - PTH
- Puppet - PUPPET
- Rucio - RUCIO
- IT Security SW - SECURITY
- vSphere - VSPHERE

Rubin Observatory

CILogon		(product in: COTS SW)	
Manager	**Owner**	**WBS**	**Team**

Short name: **CILogon** - Product key: **CILOGON**

CILogon provides an integrated open source identity and access management platform for research collaborations.

References	http://www.cilogon.org/

Uses:	**Used in:**
	Identity Management
	NCSA Identity Management

Rubin Observatory

Docker		(product in: COTS SW)	
Manager	**Owner**	**WBS**	**Team**

Short name: **Docker** - Product key: **DOCKER**

3rd party software product used for creating distributions.

References	https://www.docker.com/

Uses:	**Used in:**
	Containerized Application Management

Rubin Observatory

Firefly		(product in: COTS SW)	
Manager	**Owner**	**WBS**	**Team**
	Gregory Dubois-Felsmann	1.02C.05.06	SUIT
	Short name: **Firefly** - Product key: **FIREFLY**		

IPAC's Advanced Astronomy WEB UI Framework.

[last reviewed: G. Dubois-Felsmann - Feb 2020]

References	https://github.com/Caltech-IPAC/firefly

Uses:	**Used in:**
	LSP Portal Software

Rubin Observatory

General Parallel File System		(product in: COTS SW)	
Manager	**Owner**	**WBS**	**Team**

Short name: **Gen. P. File System** - Product key: **GPFS**

The General Parallel File System (GPFS) is a high-performance clustered file system developed by IBM.

References	https://en.wikipedia.org/wiki/IBM_General_Parallel_File_System

Uses:	**Used in:**
	ICT Provisioning and Management

Rubin Observatory

Grafana		(product in: COTS SW)	
Manager	**Owner**	**WBS**	**Team**

Short name: **Grafana** - Product key: **GRAFANA**

3rd party software product for analytics and monitoring

References	https://grafana.com/

Uses:	**Used in:**
	Monitoring

HTCondor		(product in: COTS SW)	
Manager	**Owner**	**WBS**	**Team**

Short name: **HTCondor** - Product key: **HTCONDOR**

HTCondor is an open-source high-throughput computing software framework for coarse-grained distributed parallelization of computationally intensive tasks.

References	https://research.cs.wisc.edu/htcondor/
	https://github.com/htcondor

Uses:	**Used in:**
	Batch Production

Rubin Observatory

Jupyterhub		(product in: COTS SW)	
Manager	**Owner**	**WBS**	**Team**

Short name: **Jupyterhub** - Product key: **JH3**

Provides multi-user and multi-instance support to Jupyterlab.

References	https://github.com/jupyterhub/jupyterhub/

Uses:	**Used in:**
	LSP Notebook Software

Rubin Observatory

Jupyterlab		(product in: COTS SW)	
Manager	**Owner**	**WBS**	**Team**

Short name: **Jupyterlab** - Product key: **JL3**

An extensible environment for interactive and reproducible computing, based on the Jupyter Notebook and Architecture.

References	https://github.com/jupyterlab/jupyterlab/

Uses:	**Used in:**
	LSP Notebook Software

Rubin Observatory

JIRA		(product in: COTS SW)	
Manager	**Owner**	**WBS**	**Team**

Short name: **Jira** - Product key: **JRA**

Issue Tracking and Project Management tool.

Uses:	**Used in:**
	Issue Tracking

Rubin Observatory

Kubernetes		(product in: COTS SW)	
Manager	**Owner**	**WBS**	**Team**

Short name: **Kubernetes** - Product key: **K8S**

Kubernetes is an open-source system for automating deployment, scaling, and management of containerized applications.

References	https://kubernetes.io/

Uses:	**Used in:**
	Containerized Application Management

Rubin Observatory

PostgreSQL		(product in: COTS SW)	
Manager	**Owner**	**WBS**	**Team**

Short name: **PostgreSQL** - Product key: **PSQL**

Open Source Relational Database

References	https://www.postgresql.org/

Uses:	**Used in:**

Python		(product in: COTS SW)	
Manager	**Owner**	**WBS**	**Team**

Short name: **Python** - Product key: **PTH**

Python is an interpreted, high-level, general-purpose programming language.

Uses:	**Used in:**

Puppet		(product in: COTS SW)	
Manager	**Owner**	**WBS**	**Team**

Short name: **Puppet** - Product key: **PUPPET**

Puppet is an open-source software configuration management tool.

References	https://en.wikipedia.org/wiki/Puppet_(software)
	https://puppet.com/

Uses:	**Used in:**
	ICT Provisioning and Management

Rucio		(product in: COTS SW)	
Manager	**Owner**	**WBS**	**Team**

Short name: **Rucio** - Product key: **RUCIO**

Rucio is a project that provides services and associated libraries for allowing scientific collaborations to manage large volumes of data spread across facilities at multiple institutions and organisations.

References	http://rucio.cern.ch/
	http://rucio.readthedocs.io/

Uses:	**Used in:**
	Bulk Distribution

Rubin Observatory

IT Security SW		(product in: COTS SW)	
Manager	**Owner**	**WBS**	**Team**

Short name: **IT Security** - Product key: **SECURITY**

Uses:	**Used in:**
	IT Security

Rubin Observatory

vSphere		(product in: COTS SW)	
Manager	**Owner**	**WBS**	**Team**

Short name: **vSphere** - Product key: **VSPHERE**

Third party software product for virtualization.

References	https://www.vmware.com/products/vsphere.html

Uses:	**Used in:**
	ICT Provisioning and Management

6.1.3 Third Party Libraries

Manager	Owner	WBS	Team
	Short name: **Third Party Libs** - Product key: **THPL**		

External libraries required by the DM SW products in order to compile and to run.

Products included in this section:

- Boost - BOOST

Rubin Observatory

Boost		(product in: Third Party Libs)	
Manager	**Owner**	**WBS**	**Team**

Short name: **Boost** - Product key: **BOOST**

Uses:	**Used in:**

6.2 Reference Data Products

Manager	Owner	WBS	Team

Short name: **Ref Data** - Product key: **REFD**

(from lsst-dev01:/datasets/refcats/htm/README.txt)

This directory contains LSST style gen2 butler reference catalogs in the
"indexed HTM" format, designed for use by
'lsst.meas.algorithms.LoadIndexedReferenceObjectsTask'.

For more about how the gen2 symlinked refcats work, see:
https://developer.lsst.io/services/datasets.html#reference-catalogs

The v0 directory has refcats with fluxes implicitly in Janksy units.
The v1 directory has refcats with fluxes explicitly in nanojansky units.
Support for the version 0 refcats will be removed from the stack in the future.
For more information about the change from v0->v1, see this Community post:
https://community.lsst.org/t/photocalib-has-replaced-calib-welcoming-our-nanojansky-overlords/3648

The sub-directories containing each refcat may contain 100,000 or more files
(each file representing one HTM pixel): running 'ls', 'find', or using
tab-completion in such a directory may take a very long time. To help with this,
any files of interest beyond the index files, the 'config.py' generated by the
ingester, and each catalog's 'README.txt' are listed in each section below.

6.2.1 Gaia Data

Manager	Owner	WBS	Team
Short name: **Gaia Catalogs** - Product key: **GAIAD**			

Gaia Data release catalogs.

Products included in this section:

- Gaia_DR1_v1 - GDR1v1
- Gaia_DR2_20190808 - GDR2198
- Gaia_DR2_20200414 - GDR2204

Gaia_DR1_v1		(product in: Gaia Catalogs)	
Manager	**Owner**	**WBS**	**Team**
	Colin Slater		
	Short name: **Gaia_DR1_v1** - Product key: **GDR1v1**		

This catalog is available in both v0 and v1 formats.

Uses:	**Used in:**

Rubin Observatory

Gaia_DR2_20190808		(product in: Gaia Catalogs)	
Manager	**Owner**	**WBS**	**Team**

Short name: **Gaia_DR2_20190808** - Product key: **GDR2198**

The full Gaia DR2 catalog in indexed HTM format.
See the README.txt in the refcat directory for details.

This catalog is only available in v1 format.

The configuration that was used to ingest the data is included as ‘gaia_dr2_20190808/IngestIndexedReferenceTask.py‘.

WARNING: The coordinate errors in this catalog are incorrect.
WARNING: This version of the Gaia dr2 catalog contains incorrect time epochs.
WARNING: Please use the gaia_dr2_20200414 version of the catalog instead.

Uses:	**Used in:**

Rubin Observatory

Gaia_DR2_20200414		(product in: Gaia Catalogs)	
Manager	**Owner**	**WBS**	**Team**

Short name: **Gaia_DR2_20200414** - Product key: **GDR2204**

The full Gaia DR2 catalog in indexed HTM format.
See the README.txt in the refcat directory for details.

This catalog is only available in v1 format.

The configuration that was used to ingest the data is included as ‘gaia_dr2_20200414/IngestIndexedReferenceTask.py‘.

Uses:	**Used in:**

6.2.2 Other Catalogs

Manager	Owner	WBS	Team

Short name: **Other Catalogs** - Product key: **ODATA**

Products included in this section:

- Astrometry.net Data - AND
- sdss-dr9-fink-v5b - SDSSDR9v5b
- ps1_pv3_3pi_20170110 - PS1PV3

Rubin Observatory

Astrometry.net Data		(product in: Other Catalogs)	
Manager	**Owner**	**WBS**	**Team**

Short name: **Astronomy.net Data** - Product key: **AND**

GitHub Packages:	astrometry_net_data	**??**

Uses:	**Used in:**
	Science Pipelines Distribution

Rubin Observatory

sdss-dr9-fink-v5b		(product in: Other Catalogs)	
Manager	**Owner**	**WBS**	**Team**

Short name: **sdss-dr9-fink-v5b** - Product key: **SDSSDR9v5b**

This catalog is available in both v0 and v1 formats.

Converted from the astrometry.net style SDSS catalog in '/datasets/refcats/astrometry_net_data/sdss-dr9-fink-v5b'.

Uses:	**Used in:**

Rubin Observatory

ps1_pv3_3pi_20170110		(product in: Other Catalogs)	
Manager	**Owner**	**WBS**	**Team**

Short name: **ps1_pv3_3pi_20170110** - Product key: **PS1PV3**

(from REQDME.txt)

This reference catalog, intended for use with the LSST Science Pipelines (https://pipelines.lsst.io) was constructed from the "3pi.pv3.20160422" DVO catalog of Processing Version 3 of the Pan-STARRS1 3pi survey, released to the Pan-STARRS1 Science Consortium. Following the public release of this data in December 2016 (http://panstarrs.stsci.edu), you may distribute this catalog freely.

Uses:	**Used in:**

7 DM Jira Components

This section will list the components used in the DM Jira project. Some of them are crealy related to a product included in the product tree or a low level git package. Other Jira components are not mapped in the above sections, and will be described here.

The information should be extracted from Jira automatically and checks are executed in order to mach it with the information existing in MagicDraw and GitHub.

A References

References

[DMTN-090], Banek, C., 2019, DAX Webservice Implementation Guide (Draft), URL https://dmtn-090.lsst.io/

[LDM-135], Becla, J., Wang, D., Monkewitz, S., et al., 2017, *Data Management Database Design*, LDM-135, URL https://ls.st/LDM-135

[DMTN-106], Comoretto, G., 2019, *DM Release Process*, DMTN-106, URL http://DMTN-106.lsst.io

[LDM-692], Comoretto, G., 2019, *DM Verification Control Document*, LDM-692, URL http://lm-692.lsst.io

[LDM-540], Dubois-Felsmann, G., 2018, *LSST Science Platform Test Specification*, LDM-540, URL https://ls.st/LDM-540

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B Acronyms used in this document

Acronym	Description
ADQL	Astronomical Data Query Language
AP	Alert Production
APDB	Alert Production DataBase

API	Application Programming Interface
AST	NSF Division of Astronomical Sciences
AURA	Association of Universities for Research in Astronomy
CA	Control (or Cost) Account
CADC	Canadian Astronomy Data Centre
CAM	CAMera
CCB	Change Control Board
CI	Continuous Integration
COTS	Commercial-Off-The-Shelf
CSC	Commandable SAL Component
CSV	Comma Separated Values
ComCam	The commissioning camera is a single-raft, 9-CCD camera that will be installed in LSST during commissioning, before the final camera is ready.
DAC	Data Access Center
DAQ	Data Acquisition System
DAX	Data Access Services
DB	DataBase
DBB	Data Backbone
DDS	Data Distribution System
DF	Data Facility
DM	Data Management
DMCS	Data Management Control System
DMLT	DM Leadership Team
DMS	Data Management Subsystem
DMS-REQ	Data Management System Requirements prefix
DMTN	DM Technical Note
DR	Data Release
DRP	Data Release Production
EFD	Engineering and Facility Database
EPO	Education and Public Outreach
EUPS	Extended Unix Product System
FGCM	Forward Global Calibration Model
FITS	Flexible Image Transport System
GPFS	General Parallel File System (now IBM Spectrum Scale)

GUI	Graphical User Interface
HSC	Hyper Suprime-Cam
HTM	Hierarchical Triangular Mesh
HTML	HyperText Markup Language
IBM	International Business Machines
ICD	Interface Control Document
IIP	image ingest and processing
IPAC	No longer an acronym; science and data center at Caltech
ISR	Instrument Signal Removal
IT	Information Technology
IVOA	International Virtual-Observatory Alliance
K8S	Kubernetes provisioning system
KPI	Key Performance Indicator
L1	Lens 1
L2	Lens 2
LAN	Local Area Network
LDF	LSST Data Facility
LDM	LSST Data Management (document handle)
LSE	LSST Systems Engineering (Document Handle)
LSP	LSST Science Platform (now Rubin Science Platform)
LSST	Legacy Survey of Space and Time (formerly Large Synoptic Survey Telescope)
MOC	Multi Ordered Catalogue
MOPS	Moving Object Processing System (deprecated; see SSP)
NCSA	National Center for Supercomputing Applications
NET	NETworking
OCS	Observatory Control System
OODS	Observatory Operations Data Service
OS	Operating System
OpSim	Operations Simulation
PSF	Point Spread Function
PVI	Processed Visit Image
QC	Quality Control
QSERV	Query Services (LSST Custom database)

RDBMS	Relational Database Management System
REQ	Requirement
SAL	Service Abstraction Layer
SDSS	Sloan Digital Sky Survey
SIA	Simple Image Access
SODA	Server-side Operations for Data Access
SP	Story Point
SPL	Science PipeLines
SQR	SQuARE document handle
SQuaRE	Science Quality and Reliability Engineering
SQuaSH	Science Quality Analysis Harness
SSP	Solar System Processing
SUIT	Science User Interface and Tools (LSST Data Management WBS element and team, responsible for LSP Portal Aspect)
SW	Software (also denoted S/W)
T/CAM	Technical/Control (or Cost) Account Manager
TAP	Table Access Protocol
TBD	To Be Defined (Determined)
TLS	Transport Layer Security
TS	Test Specification
UI	User Interface
US	United States
USDF	United States Data Facility
VM	Virtual Machine
VO	Virtual Observatory
WBS	Work Breakdown Structure
WCS	World Coordinate System
WEB	World wide web, internet
gcc	The GNU Compiler Collection; a C and C++ compiler